TAXONOMIC NOTES ON AUSTRALIAN HAWKS

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INTRODUCTION.

THE primary purpose of the present paper is to contribute to the series of revisions of Australian birds which must precede any semi-stable Australian check-list. Peters' work (1931) often follows Mathews' treatment of races, and these taxonomic notes are to some extent a re-examination of the proposals of that author whose types, now contained in the American Museum of Natural History, were available for study.

Early students of the group, such as Gould (1865), Sharpe (1874), Ramsay (1876), and North (1912) were compelled to work with few specimens, and although unaware of the many confusing aspects of variability, the quality of their work was remarkably good considering the nature of their limitations. We have handled many hundreds of specimens which were not available to previous workers, but have found that much still remains to be learned and that further collecting in all parts of the continent is very necessary. Especially have we lacked material from Western Australia, southern Queensland and Tasmania, and these regions should prove profitable areas for investigation in the future. Subadult specimens greatly outnumber adults in museums, many skins are incorrectly sexed or poorly labelled, and certain well-marked forms are often represented by only one or two examples.

As pointed out by Mathews (1946), the single record of *Butastur teesa* from New South Wales is unconvincing and perhaps better placed on the suspended list.

Because of its long isolation, the Australian continent has served as an important area for differentiation in this order, as in others. One may mention such distinct and fine species as *Falco subniger* and *F. hypoleucos*. *Aquila (Uroaëtus) audax* is the largest and most striking member of the *Aquila chrysaëtos* group (or, for that matter, of the genus *Aquila*). The Milvinae are very well represented, not only by widespread forms, but also by two remarkable endemics, *Hamirostra melanosternon* and *Lophoictinia isura*. If present distribution means anything, Australia was the ancestral home or, at least, the focal point of the evolution and distribution of this group of kites.

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Some fossil forms were named by DeVis (1890 to 1911) from the Pleistocene of southern Queensland and northern South Australia, but the status of most of these is doubtful. The genus *Taphaetus* may be referable to *Aquila* or *Haliaëtus,* while Lydekker (1892) expressed grave doubts as to the validity of *Necrastur*. The identity of *Paleolestes,* named from a single toe-bone, is extremely problematical.

Our remarks are based on an examination of collections in the American Museum of National History (including the Mathews collection), the South Australian Museum, the National Museum, Melbourne (including the H. L. White collection), and the Australian Museum, Sydney, as well as certain material in the United States National Museum and the British Museum.

To the Directors of the various institutions for permission to study their collections are best thanks are due, and we are especially indebted to Messrs. H. G. Deignan, Washington, W. B. Hitchcock, Melbourne, and J. R. Kinghorn and J. A. Keast, Sydney, for assistance rendered.

The only Australian Accipitres not discussed in the following notes are *Falco (Ieracidea) berigora, Circus approximans* and *Pandon haliaetus.* The first-named species was recently revised by Condon (1951), and we have little to add to Amadon's earlier revision (1941) of the other two mentioned.

Abbreviations used: AM—Australian Museum, Sydney; AMNH—American Museum of Natural History, New York; HLW—H. L. White collection, National Museum, Melbourne; NMM—National Museum, Melbourne; SAM—South Australian Museum, Adelaide.

GEOGRAPHICAL VARIATION.

Variability due to geography is still incompletely understood in Australian birds, but correlation between environment and taxonomic characters and geographical variation is often marked, as in other parts of the world, and being parallel in many species, seems to confirm certain ecological rules that were put forward many years ago.

In the birds of prey the Bergmann effect may be conveniently demonstrated by the use of wing lengths; individuals of such species as *Accipiter fasciatus, Circus assimilis, Falco berigora, Haliastur sphenurus,* and *Pandion* are larger in the cooler regions of southern Australia and Tasmania than in other parts.

There is also a tendency towards richer and darker pigmentation in populations inhabiting regions of greater humidity (Gloger's Rule). Sometimes it is a case of the colour becoming paler in the more arid regions, when orthodox (internal) clines occur; *Accipiter cirrhocephalus, A. fasciatus, Falco longipennis,*

and *F. berigora* are examples in Australia. The heavily pigmented races of *Hieraaëtus morphnoides* and *Accipiter novaehollandiae* in New Guinea may be considered further examples of this law.

For reasons not yet understood, when species rather than races are compared, the ecological rules may receive little confirmation. Species more or less characteristic of the drier areas, such as *Elanus scriptus, Falco subniger*, and *Hamirostra melanosternon* are no paler than allied species of more humid regions, and in some cases are darker. It is possible, of course, that this may point to a very recent deterioration of climate, and that these dark forms arose during more pluvial or humid periods which are known to have occurred during the Tertiary.

Clines or "character gradients" are found in areas where continuous or unbroken chains of populations occur, more especially on continents and islands. The clines most easily demonstrated are those of size and colour.

The white-headed *Pandion*, or Osprey common to the East Indies and Australia, shows a clinal increase in size in southern Australia which led Amadon (1941) to recognize southern birds as a race, *cristatus*. Such procedure has, of course, been generally followed by taxonomists, as with, for example, the American sea-eagle *(Haliæëtus leucocephalus)*, but whether such clines warrant nomenclatural recognition is more and more debated. In the case of *Pandion* of Australia, however, further material may show that there is rather an abrupt increase in size in the southern part of its range. If such a stepped cline can be demonstrated there should be less misgiving about admitting two races in the Australian region.

Stepped or external (inter-group) clines are not always readily apparent. In the Goshawk, *Accipiter fasciatus*, the difference in size in northern birds is abrupt, and the birds resemble more closely in colour some of the insular tropical forms rather than members of populations inhabiting the major portion of the continent. This suggests that the small northern race, *didimus*, could be a derivative of some island form and a rather late entrant to the Australian mainland.

However, one cannot always assume that small northern races outside Australia, as in *Accipiter fasciatus* and *Hieraaëtus morphnoides*, are an extension of the size trend discernible in Australia, for such species may have large races on some of the other (i.e., other than New Guinea) tropical islands. The population of *Accipiter fasciatus* on Rennel Island, an outlier of the Solomons, is fully as large as and apparently indistinguishable from the goshawk of southern Australia, and the races of this hawk on New Caledonia and the Louisiade Archipelago are comprised of birds almost as large. Possibly factors other than

temperature response may play the dominant role in directing changes in the bird populations of small islands.

While almost nothing is known of migratory movements, certain Australian hawks may wander far from their normal habitat. For example, it would appear that the Brown Goshawk of southern Australia may visit the Kimberley division in the north, and the falcons *Falco longipennis* and *F. c. cenchroides* occur as non-breeding stragglers to various islands north of Australia, and the latter also visits New Zealand at times.

The distribution of the diphasic goshawk, *Accipiter novaehollandiae,* in Australia and New Guinea is a special problem, for whose analysis one may consult Southern and Serventy (1947). The white phase has become exclusive in Tasmania, but elsewhere, though geographical variation occurs, there is little of regular clinal nature in the distribution of this phase. The fact that the grey phase has never been recorded in Tasmania indicates that in this species isolation is reasonably complete on that island. Also, the hawks of this genus, in parts of the world where they are non-migratory, show more geographical variation than do most other genera and are presumably more sedentary than most others. As might be expected, Tasmanian subspecies are particularly well-marked in small song birds, but in the hawks not enough collecting has been done in most species to enable satisfactory studies to be made of material from this region, although in certain instances there appear to be no differences between specimens from the island and the adjacent mainland.

DEVELOPMENT.

Study of plumage changes due to age is important in taxonomic work. In the Accipitres the downy chick is usually whitish, but in *Elanus* it is pale brownish or grey. Sexual dimorphism is generally great, females being larger, except perhaps in *Elanus* where no striking differences have been detected. Juvenals of both sexes may be markedly different from the adult, and the moult into adult plumage may be direct, as in *Elanus, Aviceda, Accipiter cirrhocephalus, Falco hypoleucos,* and *F. longipennis,* or take several years as in *Aquila, Haliaëtus, Accipiter fasciatus, F. berigora, F. peregrinus,* and *F. cenchroides.* Owing to the protracted moult in the species quoted, confusion may be caused through superficial examination or insufficient material, and a proper understanding of the factors responsible for individual variation by ornithologists whose chief interests lie in other directions is desirable in order to make their observations of value. For instance, in the Brown Hawk young birds are usually dark, even when in breeding condition, yet they have often been confused with dark

phase adults. In the Kestrel, also, both sexes may have reddish tails when young, and the young of the sea-eagles *(Haliastur* and *Haliaëtus)* might be mistaken for other species. Immaturity in goshawks and falcons is indicated by the markings of the rectrices, and since these are usually the last feathers to be replaced at the moult, a good idea of the age of cabinet specimens may be obtained.

Genus ELANUS Savigny 1809.

Type. *Elanus caesius* = *E. caerulus*. Old and New Worlds. (Four species.)

Of all the major regions, Australia alone has two species of *Elanus*. However, this does not necessarily mean that the genus originated in Australia, but merely that we are dealing with an example of double invasion or double colonization at long intervals.

Were it not for the occurrence of two species in Australia, species that are, moreover, very similar to each other, some might prefer to unite all members in a single species. Furthermore, *notatus* is more like *leucurus* of America than it is like *caeruleus* of the East Indies, Eurasia and Africa. Twice in the past and at two widely separated intervals this genus invaded Australia, presumably from the north, thus giving rise to the two species endemic there. Present day distribution of the two species, and the resemblance of *notatus* to *leucurus* of the New World, suggests that the first-named was the earlier arrival in Australia. Unusual, also, is the recent discovery of a local endemic race of *E. caeruleus* in New Guinea (Mayr and Gilliard, in press, Bull. Amer. Mus. Nat. Hist.). Presumably this species is a newcomer to New Guinea.

ELANUS NOTATUS Gould.

Elanus notatus Gould, 1838, Syn. Bds. Aust. part 4, app. p. 1: New South Wales.

Elanus axillaris parryi Mathews, 1912, Nov. Zool., 18, p. 251: Parry's Creek, northwestern Australia. Type: AMNH No. 531543; adult male; January 27th, 1909; J. P. Rogers. Wing, ? (moult); tail, 142 (worn). Coloured plate of type: Mathews, 5, plate 249, opp. p. 199.

Range. Australia; not Tasmania.

The Black-shouldered Kite has a wide distribution in Australia and appears to be a true nomad, although in many districts one or more birds will remain for weeks, or even months, before moving on. In Western Australia it is regarded as a typical inland species, whereas in eastern Australia it is perhaps just as numerous in coastal areas.

In northern Australia it has been reported at Katherine River, Northern Territory, and Barnard at one time found it breeding in the McArthur River district. In the lower Northern Territory, it was allegedly seen by members of the Horn Expedition in 1894, and in 1911 it was reported by the Barclay Expedition at Idracowra; in 1914 S. A. White believed he saw the species near Chambers' Pillar.

As might be expected, no evidence of geographical variation has been found over the entire range.

The opinion has been expressed that the black "shoulder" (lesser wing coverts) is larger in this species than in *scriptus*, but actually the reverse may be the case in fully adult birds. In *notatus*, also, the true outer primary (small and concealed) is white on the outer web and grey on the inner, whereas in *scriptus* this feather is uniformly grey.

In his account of the American species, *leucurus*, Friedmann (1950, p. 71, footnote) wrote: "It is rather remarkable that there should be no sexual difference in size . . . . since Mathews . . . , finds females to be larger than males in *Elanus notatus* and *E. scriptus*." Actually, however, the number of specimens of *scriptus* in Mathews' collection (five) is too few to determine this point, while in *notatus* the females, if really larger, are only very slightly so, as shown by the following measurements of adults.

Wing.	11 ♂, 289-302 (298);	15 ♀, 293-310 (300·5) (AMNH).
	12 ♂, 280-298 (290);	3 ♀, 280-298 (289) (SAM).
Tail.	7 ♂, 142-152 (147);	9 ♀, 142-154 (149) (AMNH).
	12 ♂, 143-153 (149);	3 ♀, 148-154 (152) (SAM).

Weights of a pair of adults taken on June 28th by K. Buller were: ♂ 270 grammes; ♀ 250 grammes. This would suggest that the sexes are about equal in size.

From the earliest stages, when the tail is very short, nestlings of *notatus* may be distinguished from those of *scriptus* by the much greater extent of black on the under-wing coverts in the latter.

At the time of hatching, young *notatus* are covered in pale brownish-coloured down, which changes within a fortnight to a smokey-grey colour. At this stage the position of the black shoulder is indicated by a bare patch of skin of dark bluish colour, perhaps caused by the unerupted dark feathers beneath. It is not known if a similar marking occurs in *scriptus*. In the week-old nestling, the iris has been observed to be hazel, the cere bluish, and the legs flesh-coloured. In a bird a fortnight old the iris was dark brown, the cere bluish-green, and the legs pale yellow.

Juvenals of *notatus* differ markedly from the adult. The top and sides of the head are rich brown and the back is brownish-grey with white tips to the feathers. The shoulder is dark grey with many of the feathers tipped with white and the black patch under the wing is less extensive than in *scriptus*. The upper breast is washed deep buff (formed by coloured tips to the white feathers), with dark brown central shafts; it becomes paler with wear. The iris at this stage is light brown, cere yellow, legs and feet bright yellow.

In several adults of both sexes the iris has been recorded as red, cere yellow, legs and feet yellow.

ELANUS SCRIPTUS Gould.

Elanus scriptus Gould, 1842, pt. 9, 1, pl. (24); South Australia. (Mathews, 1927, p. 259, gives the further restriction of Cooper Creek.)

Elanus scriptus victorianus Mathews, 1917, Austral Av., Rec., 3, p. 70; Victoria. Type (no field label): AMNH No. 531575; adult male; December, 1902. No collector is given, but it may have been A. Coles, who is mentioned as the collector of some specimens entered near the present specimen in Mathews' manuscript catalogue. Wing, 293; tail, 150. Coloured plate of type: Mathews, 5, plate 250, opp. p. 208.

Range. Normally confined to the dry interior of the Australian mainland. In abnormal seasons some birds reach the coastal districts of New South Wales, Victoria, South and Western Australia; not recorded from Tasmania.

The Letter-winged Kite, unlike its congener, is a gregarious species which nests in colonies (Jackson, 1919). In South Australia it is found in the north-east, from Minnie Downs, Lake Eyre, Manuwalkaninna, and Lake Callabonna to Moolawatana (near Lake Frome), an abnormal occurrence in 1952 being from Butler, Eyre Peninsula. Previously unknown from Western Australia, during the "southern invasion" of northern and central birds in the years 1951-53, this kite was reported from such widely separated localities as Adele Island (near Yampi) and Esperance, as well as the Pilbara district, and north and east of Perth (Serventy, 1952, 1953).

Although specimens have been taken near Dubbo and at Melbourne (Moonee Ponds), generally speaking, alleged occurrences in southern Australia prior to 1951 should be treated with caution.

In describing *victorianus* Mathews gave no characters, merely referring to his plate and description of the specimen from Victoria in his "Birds of Australia." There he had made no attempt to differentiate Victorian birds from those of other regions, but was merely describing the specimen as a representative of the species. It is unlikely that any geographical variation exists.

Probably *scriptus* is a slightly larger bird than *notatus*, because all the wing lengths of females measured are near or above the maximum found in a considerable series of *notatus*. The wing of the type of *victorianus* is not in very good condition for measurement.

Wing. ♂ (type of *victorianus*) 292 (AMNH).
♂ (breeding) 296; (juv.) 287 (HLW).
♀ 308, 311, 313 (AMNH).
♀ (subadult) 310 (AM); (breeding) 302, 305; (juv.) 302 (HLW).

Tail. ♂ ("*victorianus*") 150; 146 (AMNH).
♀ 162 (AM); 156 (HLW).

When fully adult, *scriptus* is a rather whitish-looking bird. Perched, the only means of distinguishing it from *notatus* would be by the larger black shoulder and somewhat paler grey back, both rather difficult characters to observe in the field. The bill averages slightly deeper and heavier in *scriptus* than in *notatus*. Dr. Ernst Mayr has pointed out to us that whereas in the latter the outer visible primary is two centimetres or more longer than the fourth, in *scriptus* the difference is much less, and these two primaries are usually subequal; this difference was constant in all material examined.

Mr. Warren Hitchcock has drawn our attention to a series of skins in the H. L. White collection, showing fourteen stages in the development from newly-hatched young to breeding adult. On hatching, the chick is greyish with dark (blackish) eyes, and after about seven days the head and breast become white. Later, the scapulars appear as brownish feathers, and the back is also brown. In the short-tailed nestling of about one month, the head assumes the same brown colouration as the back, and the black shoulder and under-wing coverts are well-developed. At this stage the eyes are pale brown, cere pale horn, and legs and feet pale yellow. The tail, grey at first, becomes progressively more whitish as it lengthens, and as the bird approaches adult size the rufous upper breast becomes paler. The black shoulder and under-wing markings, which are strongly developed at an early age, increase in extent, while the head and back become more whitish as the bird develops. With the completion in growth of the tail, the rufous breast disappears, the back remains brownish, but the head is white, and the primaries are broadly tipped with white. The irides at this stage have changed to a reddish-brown. In a comparable stage in *notatus* the head is streaked with brown and the edges of the secondaries, as well as the primaries, are broadly tipped with white.

The colours of the soft parts of adults are similar to those of *Elanus notatus*.

Genus AVICEDA Swainson 1836.

Type. *Aviceda cuculoides*. Synonyms include *Baza* Hodgson 1837, *Lepidogenys* Gould 1838, *Lophastur* Blyth 1842, and *Nesobaza* Mathews 1916. Australian, Ethiopian and Oriental Regions (five species).

The name *Aviceda* antedates *Baza* which, until recently, was in general use.

AVICEDA SUBCRISTATA (Gould).

Avieeda subcristata subcristata (Gould).

Lepidogenys subcristatus Gould, 1838, Syn. Bds. Austr. part 3, plate (46) and text; New South Wales.

Baza subcristata queenslandica Mathews, 1912, Nov. Zool., 18, p. 251; Mackay, Queensland. Type: AMNH No. 531727; adult female. There is no original label, but in Mathews' manuscript catalogue, where this specimen is No. 6392, it is indicated that it was one of a lot of skins obtained from Gerrard (a London dealer) in 1911. Wing, 341; tail, 209.

Lophastur subcristatus kempi Mathews, 1916, Bds. Austr., 5, p. 220; Skull Creek, Cape York. Type: AMNH No. 531725; adult (?) female; December 22nd, 1912; Robin Kemp. Wing, 327; tail, 213.

Range. Coastal northern Australia eastward and south to the northern rivers of New South Wales.

The Crested Hawk is of northern distribution in Australia, and one would not expect birds that have penetrated a short distance into New South Wales to be separable from those of Queensland, nor do they seem to be. Hartert (1931, p. 44) reached a similar conclusion, but Peters (1931), following Mathews' "Systema," recognized *queenslandica* with *kempi* a synonym, as distinct from nominate *subcristata* of New South Wales. Measurements of specimens (some probably wrongly sexed) may indicate a clinal sequence, the largest examples being from New South Wales.

The bird figured in Mathews (1916, plate 251) is unusually rufous on the abdomen, but is matched by at least three of sixteen skins from Queensland in the American Museum. There seems to be considerable variation as regards the tone of this rufous or buffy suffusion, but it may be largely age variation and fading rather than individual variation. Freshly moulted birds are darker generally. Six skins have been seen by us from New South Wales, one without more restricted locality, one from Goondiwindi, one from Clareville (Pittwater), two from Richmond River and another from Casino, not far south of the Queensland border.

In New Guinea there are three races of this hawk, *stenzona* and *waigeuensis* in the west and *megala* in the east, which differ chiefly in size (Mayr, 1940, p. 7-8). Eastern Australian birds are larger than the New Guinea races, and the grey of the breast and ventral stripes or barrings are paler.

Sexual dimorphism seems to be somewhat reduced in the Australian birds, although material is not well enough labelled to work out the details, more particularly since wear is so great or moult is so protracted in this species that some portions of the plumage of many Australian specimens are badly bleached and foxed.

Little is known of the occurrence of the Crested Hawk in the Northern Territory, but it has been reported from the Darwin area and as far south at least as Adelaide River township. Condon, during the years 1943-1944, found it a rare species and observed it only at Batchelor, about 50 miles south of Darwin. It was reported from the lower Northern Territory, at Palm Valley, by Whitlock in 1925, but this record must remain doubtful as it has not been seen by other visitors to this area.

There is a single record from the Kimberley area, Western Australia, and examination of the specimen obtained suggests that a distinct geographical race occurs in that region, and to which Territory birds may also belong.

AVICEDA SUBCRISTATA NJIKENA, subsp. nov.

Type. HLW 8329, Nat. Mus., Melbourne; adult male, fresh plumage; Fitzroy River, Western Australia; August 8th, 1924; F. L. Whitlock collector.

Wing, 310; tail, 192; tarsus, 30. "Iris golden yellow (eyes very prominent), bill bluish, culmen darker, legs drab" (from field label).

Diagnosis. Smaller than eastern Australian birds (wing ♂ 310, against 321-348); top of head dark blue-grey, face blue-grey, generally darker above; less grey on hindneck (collar) and upper back; barrings on breast blackish-brown, without rufous tinge; some rufous on foreneck; under tail coverts deep ochraceous as in *A. s. subcristata;* rump dark slate-grey, also retrices, with blue-black barrings and terminal band. *Njikena* is the tribal name of the aborigines inhabiting the area where this bird was collected.

In general appearance and size the type of *njikena* seems closest to *bismarckii* of the Bismarck Archipelago. The closest race geographically is *timorlaoensis*, which occurs in the island chain from Lombok to Timorlaut, but it is smaller still than *njikena* and the cross-barrings are more as in *s. subcristata*. Another form, *pallida*, from south-east and Kei Islands, is also small, but lacks the blackish tone in the barrings, while typical *stenzona* from Aru Islands and western New Guinea has blackish barrings and pale ochraceous under tail coverts.

Whitlock, in his account of his trip to the Fitzroy River (1925), stated that he believed he saw the mate to the bird described above. The species is very sedentary, ten subspecies being known from the islands to the north of Australia. Wing measurements:

New South Wales. ♂ 329; ♀ 358 (AMNH).
♂ 328, 329, 329; ♀ 345 (AM).
Queensland. 12 ♂, ♀ 321-344 (332·5) (AMNH).
3 ♂ 340-348; ♀ 320, 332 (SAM).
Western Australia (type of *njikena*). ♂ 310 (HLW).
Eastern New Guinea and islands (*megala*, from Mayr, 1940, p. 8).
8 ♂ 298-313 (307·4); 8 ♀ 314-334 (323·5).
Western New Guinea, Aru and other islands (*stenozona*, from Mayr, *loc. cit.*).
8 ♂ 290-303 (296·8); 5 ♀ 296-314 (305·6).
Waigeu Island (*waigeuensis* Mayr, 1940, p. 8). ♀ 314-319.
South-east and Kei Islands (*pallida*, from Stresemann, p. 305).
♂ 286-295; ♀ 300-314.
Lombok to Timorlaut, etc. (*timorlaoensis*, Stresemann, *loc. cit.*).
♂ 295-306; ♀ 310-327.
Bismarck Archipelago (*bismarckii*, Stresemann, *loc. cit.*).
♂ 309-312; ♀ 317-330.

In young birds of *A. s. subcristata* the grey breast is lacking and the cross-barring are much narrower than in the adult, while the upper surfaces are brownish, perhaps accentuated by fading and wear.

Genus MILVIUS Lacépède 1799.

Type. *Falco milvus*. Old World (two or three species).

MILVUS MIGRANS (Boddaert).

Milvus migrans affinis Gould.

Milvus affinis Gould, 1838, Syn. Bds. Austr., part 3, plate (47, fig. 1) and text; Australia (restricted to New South Wales by Mathews, 1916).

Milvus korschun napieri Mathews, 1912, Nov. Zool. 18, p. 249; Napier, Broome Bay, Kimberley Division, Western Australia. Type: AMNH No. 532065; adult female (no date given); G. F. Hill collector; wing 408, tail (long outer feathers), 252.

Range. Lesser Sunda Islands, Timor, Celebes, New Guinea, Bismarck Archipelago. In Australia mainly north of about 20° south latitude.

It is probable that the Black Kite is only a recent arrival in the north of Australia, one which may yet establish itself in the south as a result of large scale radial dispersal movements during abnormal seasons (see Serventy, 1953).

We have compared specimens from the Celebes, the Lesser Sundas, New Guinea, and various parts of Australia without detecting geographical differences.

Although sexual dimorphism is slight, recently collected material shows that the bill is shorter and more strongly hooked in the male than in the female.

Genus LOPHOICTINIA Kaup 1847.

Type. *Milvus isurus;* Australia (one species).

The single member of this monotypic genus bears a strong resemblance to the Red Kite (*Milvus milvus*) of Europe, and were it not for the fact that the latter has transverse scutes down the front of the tarsus, while *isurus* has reticulations, one might be inclined to assign the Australian bird to the genus *Milvus*. Although the nature of the tarsal covering is undoubtedly a rather variable character when well-marked differences occur among closely related forms (the scales are reticulate in *Hamirostra* also), they must be given importance. In *Lophoictinia* the coracoids are distinctive, being short and relatively wide and heavy, and the right coracoid overlies ventrally the left, which is the reverse of the condition of the pectoral arch met with in *Aquila, Circus, Falco,* and *Hieraaëtus*. Instead of overlying one another, the coracoids just touch in *Milvus, Haliastur* and the unrelated *Elanus*. We have no skeletal material of *Hamirostra* for comparison.

Published records and notes on stomach contents indicate that this species is a persistent hunter of birds, and probably also a nest-robber. In its actions it has been likened to a harrier, and possibly it is mistaken at times for one in the field.

LOPHOICTINIA ISURA (Gould).

Milvus isurus Gould 1838, Syn. Bds. Austr., part 3, plate (47, fig. 2) and text; Australia=New South Wales, according to Mathews, 1916.

Milvus isurus westraliensis Mathews 1912, Nov. Zool., 18, p. 250, Perth, Western Australia. Type: AMNH No. 532146; adult male; November 7th, 1904; "Dr. Kelsall"; wing, 455.

Range. Australian mainland.

The Square-tailed Kite is a rare species which is likely to turn up at unexpected times and places. For instance, Ashby collected a bird at Blackwood, near Adelaide, in October, 1919, and the few specimens contained in

museums have been taken from such widely separated localities as Pubelup and Broome Hill, Western Australia, Trangie (north-west of Narromine), and Sydney, New South Wales, and Gayndah (west of Maryborough), Cooktown and Cape York, Queensland.

The type of *westraliensis* is in rather abraded and soiled plumage, but so far as can be judged it does not differ from specimens from Queensland in the American Museum. The type is rather a small specimen, but one of the Queensland males has the wing only three millimetres longer.

At present there is no evidence of geographical variation. A male in the South Australian Museum, from Pubelup, collected by the late Major H. M. Whittell on December 30th, 1938, is a juvenal. It is a more "golden" bird than all others seen and entirely lacks the broad blackish stripes on the breast and head, thin blackish shafts on the feathers being the only indication of striping, with a few small black streaks on the nape. The rump is whitish, recalling the Swamp Harrier (*Circus approximans*). In this bird the iris was "grey-brown," cere "flesh colour," and feet "white."

In adults the irides have been recorded as "yellow," as also are the cere, legs and feet; the bill is bluish horn.

Wing. ♂ south-western Australia 445, 470 (SAM; HLW); 455 (*westraliensis*).
♀ 470 (HLW).
♂ New South Wales 450, 460 (HLW).
♀ South Australia 475 (SAM).
♀ Cape York 470 (SAM); eastern Queensland 490 (AM).
♂ Queensland 463, 462, 460, 466, 482 (?—shot from nest—may be mis-sexed); ♀ 480; unsexed, 465 (AMNH).

Genus HAMIROSTRA Brown 1846.

Type. *Hamirostra montana* = *Buteo melanosternon*. Australian mainland (one species).

The systematic position of this monotypic genus is still uncertain, but it may be related to the Kite *Lophoictinia*. The legs and feet are strong, the tarus heavy, feathered one-third in front and reticulated, but with a single row of scales in front somewhat larger. In its actions and posture it is unlike any other medium-sized Australian hawk, and rather resembles the Buteos or "Buzzards" in its habit of soaring in wide circles often to great heights, with separated primaries or "fingers." Like a Buteo, too, its flight is rather laboured, becoming swift on attacking when it grapples with its prey on the ground.

Although McGilp (1934) and Serventy and Whittell (1951) have stated that *Hamirostra* does not feed on carrion, perusal of various authors quoted by Mathews can leave no doubt that it does so at times. One of the specimens in Mathews' collection had, according to the collector, J. P. Rogers, fed upon a decomposed kangaroo. A similar habit has occasionally been reported in the Common Buzzard (*Buteo buteo*) of the Palaearctic Region. Despite all these resemblances to buzzards it is considered that *Hamirostra* must be regarded as a kite, and it is unfortunate that the name "buzzard" has become firmly established amongst ornithologists in Australia. It is suggested that the bird be known as the Black-breasted Buzzard-Kite.

HAMIROSTRA MELANOSTERNON (Gould).

Buteo melanosternon Gould 1841, Proc. Zool. Soc., London, 1840, p. 162; interior of New South Wales.

Hamirostra montana Brown 1846, Illustr. Gen. Bds., part 8, p. 12; Swan River, Western Australia.

Gypoictinia melanosterna decepta Mathews 1912, Nov. Zool., 18, p. 250; Parry's Creek, north-western Australia. Type: AMNH No. 532147; female; February 4th, 1909; J. P. Rogers collector. Wing, 447. Coloured plate of type: Mathews, Bds. Austr., 5, plate 248, opp. p. 188.

Range. The northern and interior regions of the Australian mainland.

This short-tailed raptorial bird is a rare species judging by the limited number of specimens in collections. It is generally accepted that a light and dark phase occurs, but we have seen no very young birds with characters of the dark phase. In the Mathews collection there are three skins from the Northern Territory and four from north-western Australia. All of them lack the black head and breast from which the species takes its name, but all appear to be adults and at least one of them was taken at the nest. They are rather uniform, although great individual variation was observed in specimens in other Australian collections. In some light phase birds the dorsal surface may be more rufous than in others, while in certain dark phase examples the hind-neck is deep rufous and there is also much rufous on the back. Other dark birds lack entirely any rufous colouration above, and the presence of this feature is probably a sign of immaturity.

Light phase specimens have been examined from Marngoe Creek, W. Kimberley, Point Torment, north-west Australia, Alexandra, Northern Territory (nesting) (AMNH), Northern Territory, Parry's Creek, Western Australia, and Byrock (HLW) and Clare (SAM), New South Wales, while the dark phase

has been taken in Western Australia (no exact locality (AM)), at Borroloola (HLW), Northern Territory, Sedan (SAM) and Cooktown (AM), Queensland, Mossgiel (AM), New South Wales, and Swan Hill (NMM), Victoria.

Wing. ♂ Western Australia 455 (AM).
♂ North Queensland 445 (AM).
♂ New South Wales 460 + (HLW), 452 (SAM).
♀ type of *decepta* 447 (AMNH).
♀ Northern Territory 455 (HLW).
♀ New South Wales 477 (AM).
♀ North Queensland 462 (SAM).

The nestling has been described as "clothed in bluish-white down with a few rufous feathers on the head and back . . . . bill horn-colour, the legs and cere pinkish-grey, and the irides brown." (McGilp, 1934.)

There is a chick labelled "about one month old" in the Australian Museum which was collected at Mossgiel, New South Wales, by K. H. Bennett, in November, 1884, which is covered with white down, with rufous feathers just appearing on the head, hind-neck, scapulars, and with the remiges and rectrices just showing, and the irides are recorded as "clear light brown," cere "bluish," legs and feet "white," and claws "black."

Two nestlings in the Australian Museum, collected at Mossgiel, New South Wales, in December, are labelled "about six weeks old." Both birds are feathered and bright rufous generally; on the under-surfaces the very bright rufous feathers of the foreneck and breast have dark shafts which are less prominent on the abdomen. Above both birds are blackish on the back, but the remainder of the bright rufous feathers all show dark shafts, including the scapulars, rump and upper tail coverts. From above the tail is brownish-grey, tipped with buffy white. "Iris, clear light brown; cere blnish-white; bill, basal half of upper mandible bluish, remainder black; lower mandible bluish; legs and feet white with black claws."

In the adult the iris is "rich hazel"; cere "greenish-white"; bill "horn colour with black tip"; legs and feet "pinkish" with "black" claws.

Genus HALIASTUR Selby 1840.

Type. *Haliastur pondicerianus* = *Falco indus*. Synonym *Ictiniastur* Mathews, 1915. Malaysia and Australasia (two species).

The name, *Ictiniastur*, was originally introduced by Mathews as a subgenus for the species *sphenurus*, but cannot be upheld.

HALIASTUR SPHENURUS (Vieillot).

Milvus sphenurus Vieillot, 1818, Nouv. Dict. d'Hist. Nat., 20, p. 564; "Australasie" = New South Wales.

Haliastur sphenurus territori Mathews 1912, Austral Av. Rec., 1, p. 88; Daly River, Northern Territory. Type: AMNH No. 532299; adult male; September 24, 1894; Knut Dahl. Wing, 379?; tail, 245? (badly worn).

Haliastur sphenurus johannae Brasil, January 7, 1916, *Rev. Franc. d'Orn.*, 4, p. 201; New Caledonia.

Haliastur sphenurus sarasini Mathews, February 29, 1916; Bds. Australia, 5, p. 169; New Caledonia. Mathews designated no type. His collection contains only one specimen from New Caledonia, a female taken November 18, 1914, by P. D. Montague, now AMNH No. 532341. This might be considered the type; on the other hand, it cannot be proved to be such, and it is possible that Mathews, who had a habit of writing new names on labels attached to specimens, examined other New Caledonian material. A search of collections, such as those of the British Museum, may reveal a specimen so labelled.

Range. New Caledonia, New Guinea, Australia; (?) visiting northern Tasmania.

Amadon (1941) revised this species and admitted no races. Re-examination of large series from Australia and New Guinea and of three from New Caledonia re-affirms this conclusion. Admittedly, some specimens from southern Australia are very large, but this is not true of all of them, and the slight size cline does not seem worthy of subspecific status. There seems to be no important colour variation. The newly moulted feathers fade and bleach more rapidly in Australia than in the more humid climate of New Guinea, but any slight difference visible in series seems to be due to this cause and not to geographic variation.

The following data for three females collected by L. Macmillan are of interest: adult, New Caledonia, May 15, 1939; wing, 415; weight, 921 grammes (fat). Adult, southern Queensland, March 25, 1940; wing, 425; weight, 761 grammes; immature (on wing), April 6, 1940; wing, 403; weight, 517 grammes.

The name "Whistling Eagle" is a misnomer, and we feel consideration should be given to the suggestion that this species be called the "Whistling Kite," especially as the birds often gather in large numbers, are kite-like in their actions, and are, in fact, kites!

HALIASTUR INDUS (Boddaert).

Haliastur indus girrenera (Vieillot).

Haliaetus girrenera Vieillot, 1822, Gal. Ois., 1, p. 31, pl. 10: "India, Bengal, Pondicherry, Coromandel and Malabar, also New Holland according to Latham." The type locality has been restricted to Australia[1], and more specifically New South Wales, as the plate is said to represent the Australian form. The species occurs in New South Wales, though we have seen no specimens from there. Stresemann (1951) has shown that the "Expedition Baudin," which secured the Australian birds named by Vieillot, collected only a limited number of species in New South Wales. He does not mention this species, but the problem is less important in that only one race is found in Australia.

Haliastur indus subleucosternus Mathews, 1912, *Nov. Zool.*, 18, p. 249; Augustus Island, north-western Australia (published as "Derby" in original description). Type: AMNH No. 532273; adult female; August 4, 1910; G. F. Hill. Wing, 372; tail 200 (?).

Range. Australia, chiefly the northern, mangrove-bordered coasts, and reaching northern New South Wales, which has been designated as type locality, but from whence we have seen no specimens. Also Papuan region and Moluccas, intergrading with *intermedius* on islands to the west of New Guinea, and extending eastwards to the Bismarck Archipelago. Normally a coastal species in northern Australia, it will often proceed far inland along the margins of rivers.

Diagnosis. Differs from *H. i. indus* and *H. i. intermedius* by having the breast usually immaculate white (without black shaft streaks). Differs from the Solomon Islands population as noted under the description of the following race.

The nominate race of the Brahminy Kite, which is confined to south-east Asia (India, Burma, southern China, etc.), is replaced in southern Annam, northern Siam and the Malay Archipelago east to Celebes and the Lesser Sundas by the race *intermedius*.

Although New Guinea birds appear a little smaller than Australian ones, the difference is hardly as great as the wing measurements suggest. Many of the New Guinea specimens are moulting or in poor feather, and it is suspected that some may be wrongly sexed.

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[1]Rothschild and Hartert, Nov. Zool., 21, p. 210, 1914.

Wing. Australia, 7 ♂, 358-377 (368); 3 ♀ 367, 372, 378; 2 labelled "♂" 378, 390 (AMNH).
Northern Territory, ♂, 343 (SAM).
North-western Australia, ♀, 375 (SAM).
Cape York, ♀, 358 (SAM).
New Guinea (and coastal islands), 15 ♂, 348-378 (359); 10 ♀, 353-373 (364) (AMNH).
New Ireland (no sex), 360 (SAM).

HALIASTUR INDUS FLAVIROSTRIS, subsp. nov.

Type. AMNH No. 221221; adult female; Bougainville Island, Solomons; April 17, 1928; Whitney South Seas Expedition. Wing, 383; tail, 207; culmen from cere, 30; depth of bill at front margin of cere, 20.

Range. Solomon Islands (including Nissan Island), also some of the easternmost islands of the Bismarck Archipelago, and Feni Island, east of southern New Ireland.

Diagnosis. Agrees with *girrenera* of Australia and Papua in having the breast usually immaculate white. Differs from it, and from the other races of the species, by having (adults) the bill entirely yellow, without blackish areas at the base of either mandible. The bill of *flavirostris* is also, when compared with that of *girrenera*, perceptibly heavier and more "aquiline."

This race is doubtless of very general occurrence throughout the Solomons. Specimens were examined from the following islands in this archipelago: Arnarvon, Bagga, Beagle, Bougainville, Choiseul, Gizo, Gower, Gaudalcanal, Kulambangra, Pavuvu, Shortland, Ugi, Vella Lavella, Wickam Arch, Ysabel.

Although specimens from the Admiralty Islands, New Britain, New Hanover, Lihir, Squally Island, and even New Ireland (one skin) are very close to or inseparable from *girrenera*, four birds from Feni Island definitely belong to *flavirostris*. Whether this Solomons' race has, correlated with its heavier bill, more predatory habits than other Brahminy Kites is not known. If so, it would form an interesting parallel to the sea-eagles represented in the Solomons by the species *Haliaëtus sanfordi*, which has more predatory habits than *leucogaster* (Mayr, 1936, p. 3).

Flavirostris averages larger than *girrenera* from Papua, but we have not enough Australian birds in good feather to be sure how they compare with *flavirostris* in size. Two unsexed Australian birds in the American Museum are fully as large as any of the Solomon Island ones, while two females in the South Australian Museum, one from the Northern Territory and one from Cape York, are slightly smaller and larger respectively than the type of this new race.

The belly in *flavirostris* averages paler rufous than in *girrenera*. While the difference is unmistakable in our material, the difference may possibly be due to wear or bleaching. No difference in colour was visible in dorsal aspect, nor did comparison of immature stages reveal colour differences.

A female was selected as type of *flavirostris* because the heavy bill is often more apparent in this, the larger sex. The colour of the bill of this race, as noted by the collectors, was usually given as "yellow," once as "chrome yellow," once as "horn with a yellow tinge," and once as "green." In the dried skin "horn with a yellow tinge" might be the best description.

Although females of this species are somewhat larger than males, it is not always possible to sex specimens accurately by measurements. The following data doubtless include some mis-sexed birds.

Wing. Solomon Islands, 16 ♂, 357-384 (371); 13 ♀, 371-390 (379).
Feni Islands, 2 ♂, 372, 373; 2 ♀, 378, 383.

Dr. E. Mayr, while with the Whitney Expedition in the Solomons, obtained the weights of three adult males, as follow: 625, 625, 650 grammes.

Genus ACCIPITER Brisson 1760.

Type. *Accipiter* Brisson = *Falco nisus* Linné. Synonyms include *Astur* Lacépède 1799, *Leucospiza* Kaup 1844, *Urospiza* Kaup 1854, and *Paraspizias* Mathews 1915. Old and New Worlds (about 45 species).

All the generic synonyms given above were used at some time or other by Mathews in his various writings; none can be upheld. There are no reliable characters available for separating the goshawks (under *Astur*) from *Accipiter* (cf. Peters (1931), p. 205, footnote).

Owing to variation in size, plumage, coloration and pattern, some confusion has occurred as to the number of Australian species which should be admitted. Gould (1865), Sharpe (1874, 1899), North (1912) and Mathews (1946) all regarded the "Grey" and "White" Goshawks as separate species, but there seems little doubt that these are merely colour phases of a single species, *Accipiter novaehollandiae*.

Accipiter fasciatus and *A. cirrhocephalus* are sibling species which almost defy exact definition on a physical basis apart from size; both pass through similar plumage stages, but the changes are more prolonged in the first-named. In birds from the extreme north of Australia, males of the former are about the same size and colour as females of the latter, and mis-sexed cabinet specimens may add to the confusion. In southern birds, small males of *fasciatus* also provide some difficulties. Perhaps the most reliable feature for separating the

two species is the bill, which in the larger is always noticeably heavier. Measurements of the greater height of the maxilla or upper mandible have shown that in *didimus*, the northern race of *fasciatus*, this is about 10 mm., while in females of *cirrhocephalus* it rarely exceeds 8·5 mm. In the cabinet skin the feet may dry in such a way as to make measurement difficult, but it is usually quite apparent that the tip of the hind claw reaches only to the proximal end of the last segment of the middle toe in the Collared Sparrowhawk, whereas in *fasciatus* it reaches to the base of the claw of the middle toe. Nevertheless, in the Brown Goshawk the condition is more variable, and in some birds the tip of the hind claw only reaches to about the middle of the middle toe. Because of these differences in the toes *fasciatus* was finally placed in *Astur* with the goshawks.

Slight differences in the barrings of the primaries may also be observed. In *cirrhocephalus* the dark barrings are usually wider and stronger at all stages, whereas in *fasciatus* they may be narrow and tapering, with the outer edge of the feather light-coloured, and the bars not extending so far towards the tip of the wing. Exceptions in both species occur.

In young birds, differences in the tarsal scutes permit ready separation of the species. In *cirrhocephalus*, which moults directly into adult plumage from the juvenal stage, the scutes are fused at quite an early age, but in *fasciatus* the "booted" condition is found only in old birds.

Much confusion has occurred regarding the status of the problematical "West Australian Goshawk," *A. cruentus* of Gould and other early writers, but we have been unable to discover any discernible basis for its recognition, either as a species, "hybrid," or geographical race. Gould's type specimen, which came from the York district, Western Australia, appears to have been merely a rather small individual in fully adult plumage (cf. Ramsay 1879, p. 174; Gurney 1881, p. 262). North (1898, p. 16-18; 1912, p. 194) dealt at some length with "*cruentus*," and referred to it as "undoubtedly the rarest" of Australian Accipitres, but examination of specimens in the Australian Museum labelled as such (by Ramsay or North) has shown that they are typical *didimus*.

Mathews, who examined the type of *cruentus*, found that North's "*cruentus*" was not the same as Gould's bird, but "the common bird of Western Australia" (i.e., *fasciatus*) (quoted by White, 1915).

ACCIPITER FASCIATUS (Vigors and Horsfield).

Accipiter fasciatus fasciatus (Vigors and Horsfield).

Astur Fasciatus Vigors and Horsfield, 1827. Trans. Linn. Soc. London, 15, p. 181; New South Wales.

Astur cruentus Gould, 1842 (1843), Proc. Zool. Soc. London, p. 113; York district, Western Australia. Type said to be in the Academy of Natural Sciences of Philadelphia (No. 1279).

Astur maculosus Coles, 1897, Vict. Nat., 14, p. 43; Blackburn, Victoria. (Type said to be in British Museum.)

Astur fasciatus mackayi Mathews, 1912, Nov. Zool., 18, p. 246; Mackay, Queensland. Type: AMNH No. 533214; adult male. The specimen has no date, locality, or field label, but according to Mathews' catalogue was acquired in 1911 from the London dealer, Gerrard. Wing, 290? (worn moulting); tail, 237? (worn). The type is in excessively worn plumage; this is the basis for this supposedly brown-backed race.

Urospiza fasciata rennelliana Kinghorn, 1937, Proc. Zool. Soc. London, ser. B, 107, part 1, p. 180; Rennell Island. Type: Austr. Museum No. O 32284. The specimen has no date or field label, but bears a printed label "Astur versicolor Ramsay. Hab. Ugi Isld. Sex female." The entry in the Australian Museum Register merely states "Rennell Island. Coll. G. A. V. Stanley." Wing, 280; tail, 214; tarsus 75. The type is in very poor condition and the plumage is badly faded and worn.

Range. The whole of Australia, except the coastal northern regions from Cape York westwards to the Kimberleys; Tasmania; Norfolk Island (queried by Peters, 1931, no specimens seen by us); Rennell and Bellona Islands, off the southern Solomons.

The Brown Goshawk occurs in all parts of Australia and Tasmania, and has a wide distribution in tropical regions from Christmas Island in the Indian Ocean through the Lesser Sundas and Timor to New Guinea, New Caledonia, Lifu, Loyalty Islands, and Fiji eastwards. Peters (1931) listed seven subspecies, including three from Australia, and Rand (1941) has described an additional New Guinea race, *dogwa*.

Peters used the name *cruentus* for birds from "West and South Australia," perhaps following Mathews, but there is little justification for recognizing a dry country race even though birds from a wide area over the interior of the continent are duller and with greyish heads, characters which seem to be largely induced by wear and fading. Examples from more humid regions have blackish heads, and we have seen specimens from Napier Broome Bay, north-western Australia, Vasse, south-west Australia, Adelaide, South Australia, Heidelberg, Victoria, and Ravenshoe, north Queensland, which are inseparable from New South Wales birds. In several south-western individuals in the Australian Museum the thighs were brighter rufous than in eastern ones both in the adult

and young, but generally speaking western birds seem to be practically indistinguishable.

Although nothing is known of regular movements of the Brown Goshawk in Australia, specimens examined suggested that, in Western Australia at least, southern birds may wander to the extreme north of that State, thereby invading the territory of *didimus*. An adult female in the National Museum, Melbourne, collected on June 5, 1910, at Napier Broome Bay is fully as large as and almost indistinguishable from dark-headed birds from Vasse (near Busselton), Western Australia, Plenty River (near Melbourne), Victoria, and Cobborah, New South Wales. Furthermore, during a recent Australian Museum expedition, Mr. Allen Keast collected a large female (wing 290), in juvenal plumage, at Forrest River Mission, about 50 miles south of Napier Broome Bay, on June 2, 1952. Two other juvenals in the Australian Museum (no dates recorded), and one in the South Australian Museum (female, April 8, 1913) were taken near Derby, north-western Australia, and all are large birds. Although more brownish above and below than examples of corresponding age seen from the south, they are matched by at least one from Homebush, New South Wales, and several from Swan River and King George's Sound, Western Australia. The breast and foreneck are heavily-barred brown, the whitish throat is heavily streaked with brown, and the thighs are dull rufous-brown and buffy white.

Tasmanian birds are generally somewhat larger, a little darker above and below, with more whitish throats than most from the adjacent mainland. However, at this stage, we prefer not to introduce a name to indicate the differences in this population, which appears to merge with southern mainland birds.

It is remarkable that on Rennell Island and its outlier, Bellona Island, there is a population of this species very similar to the New Caledonian (*vigilax*) and Australian races. Rennell, though usually included with the Solomons, is considerably south of that group and has a somewhat different fauna, and *Accipiter fasciatus* does not occur in the Solomons proper.

The Whitney Expedition secured a pair of adults of *fasciatus*, the male in badly worn plumage, on Rennell and Bellona. This was before the American Museum had any specimens of *vigilax*, and Mayr, in his report on the Rennell Expedition (1931), based his assignment of these birds to *vigilax* on a comparison made for him in the British Museum by the late A. Goodson, who noted their similarity to *fasciatus* of Australia.

With the present fine series of *vigilax*, it became evident that the pair of adults from Rennell is larger in every dimension than *vigilax*. The difference is not very great, however, and merely serves to bring the Rennell birds into the size class of *f. fasciatus*, from which they appear inseparable. In particular,

the adult male from Bellona, which is in fine plumage, agrees in every detail of colour and size with specimens from southern Australia.

In the meanwhile, a third specimen was collected on Rennell by G. A. V. Stanley, and became the type of Kinghorn's *Urospiza fasciata rennelliana*, differentiated as follows: "In size and colour this bird is very similar to the narrow-banded form of *U. fasciata*. The tail feathers, though much worn at the tips, are a little broader than those of *U. fasciata* (Australian), the tarsus is longer, and the legs and feet more powerfully built . . . , Wing, 280." These differences are not apparent in the two birds in the American Museum. Examination of the type of *rennelliana* in the Australian Museum confirms Kinghorn's remarks to some extent, but the differences are well within the range of variation met with in Australian birds, and the specimen is in poor condition. It appears to be rather faded, with a "washed-out" appearance, and in this respect is similar to a specimen of *didimus* from Darwin. The head is dark grey, the face pale brownish-grey, and there is a trace of a red collar on the sides of the neck; the upper surfaces are greyish-brown. Ventrally, the feathers are barred pale rufous and dull white (slightly wider and darker on the breast), and the thighs are of the same colour.

Unless by chance the Rennell birds reached there rather recently from Australia, one would not expect them to be the same as the Australian race. We conclude, nevertheless, that *rennellianus* must be considered a synonym of *fasciatus* until proved otherwise.

A few very large examples (mainly females) were examined from New South Wales and Tasmania, but the size is not indicated by wing or other conventional measurements. Nevertheless, even allowing for different methods of preparation resulting in some distortion, it is believed that outsize birds (and also "runts") may be met with occasionally.

Except where otherwise indicated, measurements given below are taken from skins in museums in Australia.

Wing, ♂, adult.

South-eastern Australia (6), 260-275 (265) (AMNH).
New South Wales (9), 255-278 (265).
Victoria (1), 270.
Tasmania (4), 268-272 (270·5).
South Australia (7), 256-270 (262).
Southern Queensland (1), 268 (AMNH).
South- and mid-west Australia (3), 250 +, 261, 262 (AMNH).
Rennell Island (1), 265 (AMNH).

♂, immature (8), 257-267 (262) (AMNH).

♂, second year
New South Wales (7), 247-270 (260·1).
Tasmania (1), 270.
South Australia (4), 255-270 (261·5).
Southern Queensland (1), 270.
South-west Australia (1), 266.

♂, juvenal
New South Wales (7), 245-275 (264·4).
Tasmania (1), 264.
South Australia (16), 227-270 (261·7).
South-west Australia (4), 238-265 (253·7).

♀, adult
South-eastern Australia (3), 302, 307, 311 (AMNH).
New South Wales (3), 302, 305, 310.
South Australia (3), 300, 302, 308.
Southern Queensland (1), 312 (AMNH).
South-west Australia (1), 305.
South-west and mid-west Australia (3), 300, 305, 313 (AMNH).
North-western Australia (1), 290.
Northern Territory (2), 287, 305.
Rennell Island (2), 280 (AM), 292 (AMNH).

♀, immature (15), 295-312 (304) (AMNH).

♀, second year
New South Wales (8), 292-311 (298·8).
South Australia (8), 265-305 (290·2).
North Queensland (1), 305.

♀, juvenal
New South Wales (6), 296-312 (304).
South Australia (10), 262-311 (300·6).
Tasmania (7), 291-305 (300·7).
South-west Australia (4), 253-290 (268·2).
North-western Australia (4), 270-290 (279·5).

Weight, 1 large ♀ imm. 593 grammes.

Altogether, we have examined and measured more than 170 specimens of this, the large, more heavily-pigmented nominate race. The general trend towards maturity is for the broad stripes and barrings of the ventral surface in the juvenal to be replaced by narrower transverse barrings, probably over a period

of several years. Immature birds far outnumber adults in collections, and this has enabled us to distinguish three plumage stages—juvenal, "second year," and adult. Individuals in fresh plumage are always darker than those in worn plumage, especially on the upper surfaces. The moult from one plumage stage to another is gradual and protracted, and is responsible for the remarkable variety of patterns met with. However, most of the variations in colour are due to wear and fading, and very few skins were seen in which it was due solely to moulting. This is remarkable considering the large number of individuals handled.

After hatching, in the late spring or early summer, the white downy chick rapidly acquires the juvenal plumage—first on the wings, then on the scapulars, back and tail. As soon as fully fledged, and when about a month old, the young Goshawk leaves the nest.

Juvenals of both sexes, which differ markedly from adults, may be distinguished by the heavy brown streaks on the breast and throat and the broad blotches or barrings on the abdomen. Above, the dark brown feathers are edged with cinnamon-rufous, this later fading to pale buff or being lost by wear. The nape is streaked with white, the central rectrices are prominently barred above, and the tibiae are indistinctly or broadly barred dull rufous and buffy white. The few Tasmanian specimens examined have the streaks on the throat reduced, and the tibiae are heavily barred fawn and buff. Juvenals of *didimus* are duller with less rufous above (perhaps due to fading), have less white at the nape, numerous streaks on the chin and throat, and dull rufous-brown tibiae with only slight indications of barring.

It is believed that the juvenal plumage is retained for nearly one year, when the "second year" plumage is gradually acquired. The first new feathers are those of the crown, cheeks, mantle, throat and abdomen, and these are fully developed before the second summer; the tail may not be replaced completely until the beginning of the following autumn.

The "second year" plumage is much like the adult, but may be distinguished as follows. The upper surfaces are dark greyish-brown without any rufous and the crown is blackish-brown or dark grey with fewer white streaks at the nape. The only trace of a chestnut nuchal collar is on the sides of the neck, while the central rectrices are paler and more distinctly barred than in the adult and are the last feathers to be acquired. Below are numerous transverse bars on the breast, abdomen and under tail coverts of dull rufous brown with darker edges adjacent to the alternating white bars; the throat is dappled grey and dull white and the tibiae have acquired narrow bars of dull rufous and white. The markings on the lining of the wings resemble the barrings of

the underparts, being rufous instead of dark brown (as in the juvenal). Individuals are commonly found breeding in this plumage.

Nothing appears to be known of the duration of the "second year" type of plumage, but it may be retained for more than one year. In most descriptions reference is made simply to "immature" and "adult" plumages, the "second year" stage being included in the last-named. There is reason to believe, however, that the fully adult bird is characterised by much finer rufous and white ventral barrings on the breast, abdomen, under tail coverts, and thighs. A prominent chestnut collar and usually the complete absence of white streaks on the nape also distinguish this stage, when the central pair of rectrices are dark in colour with the merest trace of darker barrings. Altogether, the fully adult Goshawk, examples of which are rare in collections, is a brilliantly-coloured bird when in fresh plumage. It may be recognized also by the complete fusion of the tarsal scutes, which forms the "booted" condition.

From specimens examined it would appear that the moult into adult plumage commences in the spring and continues for several months, although the body feathers are rapidly acquired.

In several adult females the iris has been variously recorded as "yellow," "bright yellow," and "dark golden"; feet "yellow"; cere "olive" or "green"; bill "blackish" or "blackish-blue." In a female juvenal the irides and feet were found to be "straw yellow."

Accipiter fasciatus didimus (Mathews).

Astur fasciatus didimus Mathews, 1912. Austral. Av. Rec., 1, p. 33; Melville Island, Northern Territory.

Range. Coastal regions from about Cooktown, Cape York, westwards to the Northern Territory and Derby, north-western Australia.

In his original diagnosis the author stated "differs from *A. f. fasciatus* in its smaller size: wing 236 mm." In addition, *didimus* is a paler bird than the other Australian race, and intergradation between the two forms seems to be of the "stepped cline" variety.

A pair of birds from as far north as Mackay, Queensland, one of them the type of Mathews' *mackayi*, are fully as large as specimens of more southern origin. Another bird, in the H. L. White collection, from Vine Creek (altitude 3,000 ft.), Ravenshoe, which is just south of Cairns, belongs to the nominate form, while a large series of birds from Cooktown are nearer *didimus* in size, but a few of them are fully as large as average examples of *f. fasciatus*. Some of the Cooktown specimens are quite as small as topotypical *didimus* from Mel-

ville Island, and do not differ in colour. The situation in north-western Australia may indicate a rather sharp area of intergradation, but the fact that a few specimens are as large and dark as *fasciatus* while others are as small as *didimus* suggests that the former may have been visitors from the south, and this has already been discussed above.

Wing. ♂, adult
Melville Island (5), 229-239 (234) (AMNH), 238 (SAM).
Northern Territory (3), 240 (AMNH), 249 (AM), 245 (HLW).
Cape York (4), 235, 240, 246 (AMNH), 247 (NMM).
North-western Australia (2), 230, 235? (AMNH).
♂, immature (22), 229-262 (247) (AMNH), 225-253 (243·3) (SAM).
♀, adult
Melville Island (2), 263?, 275 (AMNH).
Northern Territory (2), 270?, 277 (AMNH), (4), 270-287 (276) (AM).
N. Cape York (2), 270, 284 (AMNH).
Cooktown, C. York (7), 272-297 (287) (AMNH).
Derby, N.W.A., 265 (AM).
♀, immature
Melville Island (1), 261.
Northern Territory (5), 267, 268, 314? (AMNH), 254, 272 (SAM).
Normanton, Queensland (3), 272, 276, 290 (AMNH).
Cape York (29), 258-291 (277) (AMNH), (1), 285 (NMM).
New Guinea (*A. f. polycryptus* and *A. f. doguca*)
♂, adult (4), 223, 224, 227, 233; ♀, adult (3), 254, 256, 257.

Most of the races of *fasciatus* of New Guinea and the smaller islands north of Australia are more or less similar to *didimus,* but, for the most part, even smaller, paler, more rufous, and in some cases actually whitish on the flanks and belly (e.g., *hellmayri* Stresemann, *doguca* Rand).

Accipiter fasciatus buruensis Stresemann.

Accipiter torquatus buruensis Stresemann, 1914, Nov. Zool., 21, p. 381; Fakal, Buru.

Range. Island of Buru.

The status of this race is puzzling[2]. Stresemann said it does not differ from *fasciatus* in colour, but is smaller. He gave wing lengths as 259 and 270.

[2]See also Van Bemmel, Treubia, 19, 1948, part 2, p. 392.

The smaller of these, the type, which is the only one we have available for comparison, actually has the wing in moult. Stresemann did not mention the small north Australian race *didimus*, a valid form which Mathews had described two years before. Direct comparison of the type of *buruensis* with topotypical females of *didimus* reveals no appreciable difference. The bill of *buruensis* seems a bit heavier (and perhaps the feet also); it is slightly greyer on the chest than most *didimus*, thus resembling *f. fasciatus* rather than *didimus*. Were Buru adjacent to north Australia we should not hesitate to list *buruensis* as a synonym of *didimus*.

Buru is some distance removed, however, and distinct races inhabit the islands around it, including a small rufous race *wallacii* found on some of the smaller islands more or less intermediate in geographical position between Buru and Australia. It is not expected, therefore, that the birds of Buru will belong to the northern Australian race, and until proved otherwise by adequate material, it must be assumed that *buruensis* is valid on the basis of slight differences noticed and perhaps additional ones that will become evident in series.

Accipiter fasciatus vigilax (Wetmore).

Astur fasciatus vigilax Wetmore, 1926. Condor, 28, p. 6 (new name for *insularis* Sarasin, pre-occupied); New Caledonia.

Like *tjendanae* of the island of Sumba, this race is similar in colour to nominate *fasciatus*, but smaller. Mr. L. Macmillan collected a fine series of this bird for the American Museum on New Caledonia (the type locality) and on the three principal islands, Lifu, Mare, and Uvea, in the Loyalty Group. They all belong to *vigilax*, in which the bars on the underparts are rather greyish, as in *fasciatus*, except the flanks, which tend to be more rufous as in *didimus*.

Wing. ♂, adult (9), 236-253 (244); ♀, adult (5), 263-282 (275).

ACCIPITER CIRRHOCEPHALUS (Vieillot).

Accipiter cirrhocephalus cirrhocephalus (Vieillot).

Sparvius cirrhocephalus Vieillot, 1817, Nouv. Dict. d'Hist. Nat., 10, p. 329; New South Wales.

Accipiter cirrhocephalus broomei Mathews, 1912, Nov. Zool., 18, p. 247; Broome Hill, southern Western Australia. Type: AMNH No. 533982; adult male; "8/6/6" (? June 8, 1906); "T.C." (? Tom Carter). Wing, 205; tail, 150.

Range. Tasmania; Australian mainland, except the northernmost parts.

Four races[3] of the Collared Sparrowhawk may be recognised; *papuanus* (New Guinea) and *quaesitandus* (northern Australia) are smaller and more rufous ventrally than *cirrhocephalus,* while *rosseliannus* (Rossel Is., New Guinea)[4] is believed to be large and similar to the nominate form but darker above, though less heavily marked below.

Of "*broomei,*" Mathews stated, " . . . . darker above and the nuchal collar darker red," but we have seen examples in the Australian Museum from southwestern Australia which are inseparable from eastern Australian birds, including Tasmanian ones. Nevertheless, the darker colorations which characterize the nominate race are on the whole slightly more evident in the west, though most specimens from the two areas cannot be differentiated.

Colour variation in *Accipiter cirrhocephalus* in Australia parallels that in *Accipiter fasciatus*; northern birds are paler, more rufous, and in both species these trends are continued further in New Guinea. In the case of *fasciatus,* most of the other races of the northern islands are also paler and more rufous than the Australian forms, but there are also definite exceptions; *cirrhocephalus* is absent from these smaller islands.

As regards size variation within Australia, *fasciatus* is much smaller in northernmost Australia than in southern Australia, while *cirrhocephalus* is only slightly so. The two species can be confused in the north, if the two sexes are not kept separate, but hardly in the south.

Wing. 10 ♂, 200-219 (208); 8 ♀, 232-242 (238) (AMNH).
15 ad. ♂, 195-210 (205); 14 ad. ♀, 232-251 (236·5) (AM, NMM, SAM).

Although *cirrhocephalus* is very similar to *A. fasciatus* in plumage, the change from juvenal to adult is direct and takes place at the beginning of the second year; this is indicated in examples with the fine breast barrings of the adult intermixed with the heavy blotches or stripes of the juvenal. Juvenals of the two Australian races are inseparable.

Accipiter cirrhocephalus quaesitandus Mathews.

Accipiter cirrhocephalus quaesitandus Mathews, 1915. Birds of Australia, 5, p. 81; Utingu, Cape York, Queensland. Type: AMNH No. 533939; adult male; July 4, 1912; Robin Kemp. Wing, 203; tail, 154.

Accipiter cirrhocephalus haesitata Mathews, 1917. Austral Av. Rec., 3, p. 128; Cape York.

[3]Van Bemmel, 1948, Treubia, 19, p. 391, also regards *Accipiter erythrauchen* of the Moluccas as conspecific with *cirrhocephalus.*

[4]Mayr, 1940, Amer. Mus. Novit., 1056, p. 12.

Type. No skin indicated as the type of this race is present in the American Museum of Natural History; probably no type was designated. Although entered as a new race, with description and type locality, one wonders about the connection of *haesitata* Mathews, 1917 to *quaesitandus* Mathews 1915 with the same type locality. Probably in 1917 Mathews forgot that he had named the Cape York population in 1915, and yet involuntarily picked a similar sounding name. Perhaps he realized the blunder later and for this reason did not designate a type for *haesitata*.

Range. Cape York and the entire north coast area of Australia.

Diagnosis. Differs from *c. cirrhocephalus* by being less greyish, more rufous ventrally and perhaps slightly smaller. The race *papuanus*, of New Guinea, is still more rufous ventrally, and less barred; it also smaller (wing, ♂, 184).

A male from Normanton and one for north-western Australia are slightly paler than the other four adult males, all from Cape York, in the American Museum. It is probable, however, that the differences observed are due to individual variation and, in part, to plumage fading in the arid regions, because several other skins do not show this difference. Specimens of this race have been examined from Mt. Alexander (south of Derby), Fitzroy River, Brooking Creek (West Kimberley); Borroloola, Brock's Creek, Alexandra, Alligator River, Groote, Melville and Bathurst Islands (all Northern Territory).

It is probable that birds from the arid portions of the interior and Western Australia begin to show the paler, rufous coloration of *quaesitandus* at more southern localities than do those from the humid eastern coast. Yet, an adult female, taken in 1947 by Ken Buller on the De Grey River, well north in mid-western Australia, is typical of the nominate race. This bird weighed 235 grammes.

Wing. 6 ♂, 196-209 (201); 4 ♀, 229-237 (232) (AMNH).
2 ad. ♂, 194 (HLW), 200 (SAM); 6 ♀, ad. 228-242 (235·5) (HLW, SAM).

ACCIPITER NOVAEHOLLANDIAE (Gmelin).

Accipiter novaehollandiae novaehollandiae (Gmelin).

Falco novae-Hollandiae Gmelin, 1788, Syst. Nat., vol. 1, pt. 1, p. 264; New South Wales ex Latham = Tasmania fide Mathews.

Astur clarus cooktowni Mathews, 1912, Nov. Zool., 18, p. 245; Cooktown, northern Queensland. Type: AMNH No. 532939; "♀" = adult male, grey phase; May 13, 1902 (E. Olive). Wing, 261; tail, 197. As Hartert already pointed out, this bird is obviously a male and Mathews' indication of its smaller size as compared with a female from New South Wales is not significant.

Astur novaehollandiae alboides Mathews, 1912, Nov. Zool., 18, p. 246; Parry's Creek, East Kimberley, north-western Australia. Type: AMNH No. 532958; adult male, white phase; October 8, 1908; J. P. Rogers. Wing, 258; tail, 194.

Astur clarus robustus Zietz, 1914, South Aust. Ornith., 1, p. 13; Melville Island, Northern Territory. Type: SAM No. B1334; female, juv., grey phase; August 2, 1913; W. D. Dodd, collector. Wing, 285; tarsus, 79; tail, 220. "Iris yellow, feet yellow."

Range. Tasmania (white phase only); Australia (chiefly eastern and northern); Kangaroo Island.

The Grey and White Goshawks of Australia are now known to be phases of one and the same species (see also Mack, 1953). Somewhat more difficult for immediate acceptance was Stresemann's demonstration that the brown (''*etorques*'') and white (*leucosomus*) birds of New Guinea are also phases. ''Wild-type'' birds of Australia are white below, barred with grey on the breast and pale grey above; in New Guinea races they are dark grey above and rufous or deep chestnut below. The female of the race *leucosomus* is somewhat barred, so that by a total loss of the phaeomelanins and a loss in intensity of the eumelanins, a coloration like that of wild-type Australian birds could result. Such changes, in one direction or another, have been of not infrequent occurrence during the evolution of the numerous species and races of raptorial birds of the Australo-Papuan region, many of which are grey and white, others grey and rufous.

Mayr has pointed out that immatures of wild-type *leucosomus* vary greatly in the amount of phaeomelanins present. Some of them are as light (though more heavily marked) as immature wild-type *novaehollandiae*. He designated two phases of these *leucosomus* wild-type immatures: a ''rufous'' and a ''white'' one. The latter might better be termed ''pale,'' since it apparently, as Mayr concluded, has nothing to do with the true white phase of *leucosomus*. We are inclined to believe that this variation in immature wild-type *leucosomus* may, to a greater degree than realized by Mayr, be due to bleaching, fading, and possibly to age changes (appearance of first indications of adult rufous coloration), but there is undoubtedly some genuine genetic variation in the amount of phaeomelanins present. This helps to explain how, in wild-type *novaehollandiae*, the phaeomelanins are entirely lacking in all stages of plumage, and is further argument for regarding *leucosomus* as a race of the Australian bird.

It is impossible to say whether the paling of the wild-type plumage in the nominate race (adults are nearly white below and pale grey above) has any

selective relation to the occurrence or origin of the white phase. Certainly the latter is a discrete genetic entity; even immatures of the white phase birds are said to be pure white at all ages. At the same time, it is possible that the physiological advantages presumably correlated with the white, which in Tasmania have led to its complete establishment, are also present and responsible for the paling of the wild-type Australian birds. The by no means low incidence of the white phase in New Guinea in a race which the wild-type adults are dark-coloured might be considered to refute this suggestion. As already noted, however, there is a reduction of phaeomelanins (and perhaps in the intensity of eumelanins) in a considerable percentage of immatures of *leucosomus*, wild-type, so it is possible that the same trends discernible in wild-type *novaehollandiae* are incipient in *leucosomus*.

Although white plumage may have a direct selective advantage in gyrfalcons and snowy owls, one cannot suppose this to be the case in white phase *novaehollandiae*. More likely, the white colour is genetically linked with unknown favourable characters, and since it has not proved to be a great disadvantage it has become widespread. Hawks have few predators themselves, and apparently the white plumage does not seriously inconvenience them in securing their own prey. One observer even believed that small birds showed less fear of white goshawks than of the generality of hawks, perhaps mistaking the former for white cockatoos!

In the case of *novaehollandiae*, the increase in size and the change in colour is so abrupt when one passes from the northern islands to Australia, that some may still prefer to recognize two species. The occurrence of a white phase in *leucosomus* does, however, serve to link the island races with that of Australia and Tasmania. One is inclined to follow the current practice and make them all races of *novaehollandiae*, if for no other reason than to emphasize the amount of variation that can occur within the limits of a "rassenkreis."

It is worth pointing out that the race *misulae* Mayr, found on two of the small islands east of New Guinea, is almost as large as nominate *novaehollandiae*; its feet and bill are fully as robust as in the latter race. Wild-type, that is "grey phase," birds of *Accipiter novaehollandiae novaehollandiae* differ from those of all other races by lacking rufous in the adult. White phase birds are inseparable from white phase *leucosomus* of New Guinea, but are, sex for sex, much larger.

White phase birds in Australia are usually pure white at all ages and in all areas. We have discovered no geographical variation in colour in the grey phase. Fleay (1950) refers to one case of intermediacy, a specimen in the H. L. White collection. This bird is white, but with grey on the shoulders, back

and outer webs of the secondaries. It is a female taken at Dorrigo, N.S.W. In immature birds of the grey phase the bars on the breast are much broader than in the adults and they are slightly tinged with brown. Dorsally a faint brownish collar is sometimes evident, and this seems to represent the last stage in the disappearance of a rufous nuchal collar previously present, and characteristic of many species of Accipitres in their adult plumage.

As long since known, only the white phase of this hawk occurs in Tasmania. In Australia, as Southern and Serventy (1947) have shown in a detailed, if somewhat laboured, analysis, there is little regular or clinal variation. In particular, there is no regular decrease from south to north in the incidence of white birds, which, as a matter of fact, predominate in the Northern Territory, and apparently, in the adjacent Kimberley Division of north-western Australia (whence the only specimen we have seen is the type of Mathews' *alboides*). Although these colour phases are, of course, genetic, the percentage of white birds in Australia is far too high to warrant separating them racially from the all-white population of Tasmania.

Turning now to size variation, Mathews described a race *cooktowni,* from Cape York, and another race *alboides,* from the far north-west. Both supposedly differed from nominate *novaehollandiae* (*terra typica,* Tasmania) by smaller size. Mathews later admitted there is very little reason to think northern birds are smaller. Zietz, meanwhile, named a race from Melville Island which he believed to possess characters embodied in the name *robustus.* The type specimen is medium greyish-brown above, including the head, and has fairly heavy brownish barrings beneath, as well as an unbooted tarsus, both signs of immaturity. It is quite an average specimen in every way, and we conclude that Zietz must have lacked adequate comparative material at the time when he introduced the name *robustus.* Hartert (1931, pp. 40-41), in discussing Mathews' two types, admitted that they (and many other northern specimens) are as large as southern ones. He also detected a slight size decrease northerly which he thought might warrant recognition of *cooktowni* and most later writers have followed this course, including Peters (1931).

Although Fleay (1950) believes Tasmanian birds to be larger and heavier than others, we have been unable to discover any great variation in size in this hawk, in available material, and believe it to be non-existent or negligible. One has only to place side by side adults from Tasmania, Cape York and the Northern Territory to see that they are, in general terms, of the same size. It is true that, in series measurements, the northern birds average a bit smaller, but even this may be because the northern specimens available are in general in poor plumage. The interesting point is that the birds of such climatically

diverse and rather remote areas as Tasmania, Cape York and Melville Island and the Kimberley Division are substantially alike in size. The correct means of emphasizing this is, it seems to us, to unite all the Tasmanian and Australian birds in one race, *novaehollandiae*.

Wing. Tasmania: 3 ♂, 250, 254, 257 (all worn) (AMNH).
8 ♀, 295-309 (305) (AMNH).
South Australia: 1 ♀, 315 (AMNH).
1 ♀, 313 (SAM).
New South Wales: 5 ♂, 258-270 (AMNH).
2 ♀, 306, 312 (AMNH).
Queensland (except Cape York): 5 ♀, 290-319 (307) (AMNH).
Cape York: 7 ♂, 257-270 (261) (AMNH).
7 ♀, 293-300 (296) (AMNH).
Melville Island: 1 ♀, 303 (AMNH).
1 ♀, 285 (SAM) (type of *robustus*).
Northern Territory (except Melville Island): 1 ♂, 253 (AMNH).
2 ♀, 300, 304 (AMNH)
North-western Australia: 1 ♂, 258 (AMNH).

Genus ERYTHROTRIORCHIS Sharpe, 1875.

Type. *Falco radiatus*. Australian mainland (one species).

The single member of this genus is usually considered to be a modified goshawk. The wings are longer and the tail shorter than in *Accipiter*, but the feet suggest that genus, while the coloration, as Mr. M. Jollie has pointed out to us, is very like that of *Accipiter burgersi* of New Guinea.

Although *Megatriorchis doriae* of New Guinea has sometimes been included in this genus, as for example in Peter's Checklist (1931), such action is debatable to say the least. *Doriae* has departed from *Accipiter* in just the opposite way from *radiatus;* the wings are very short, the tail very long. Thus *doriae* resembles *Urotriorchis macrourus* of equatorial Africa, but the latter is not so far from typical *Accipiter*.

Erythrotriorchis radiatus is said to soar at times and is undoubtedly less closely restricted to forest cover than is *M. doriae*. Both species have very long, curved claws and both are bird-eaters. Presumably they branched off independently from *Accipiter* stock, but even if they are more closely related than this would indicate, they are now too unlike to fit properly in the same genus.

ERYTHROTRIORCHIS RADIATUS (Latham).

Falco radiatus Latham, 1801, Index Ornith., Suppl., p. xii; New South Wales.

Erythrotriorchis rufotibia Campbell, 1911, Emu, 10, p. 249; Napier Broome Bay, Kimberley Division, Western Australia. Type: National Museum, Melbourne, No. HLW 5369; adult female; June 21, 1910; G. F. Hill for H. L. White. Wing, 396; tail, 245; tarsus, 7·5. Paratype: HLW 5370; adult female; February 18, 1909; G. F. Hill. Wing, 395; tail, 235; tarsus, 8.

Erythrotriorchis radiatus katherine (sic) Mathews, 1916, Austr. Av. Rec., 3, p. 57; Katherine River, Northern Territory. Type: AMNH No. 534012; male moulting from very worn and faded plumage into adult plumage; July 25, 1895; (Knut) Dahl. Wing, 353; tail, 220. Coloured plate of type: Mathews, vol. 5, pl. 240, opp. p. 87.

Erythrotriorchis radiatus queenslandicus Mathews, 1917, Austr. Av. Rec., 3, p. 128; "Cedar Bay" (label says "Cardwell"), Queensland. Type: AMNH No. 534013; adult male (said to be from a collection made in northern Queensland in June and July, 1898, by collectors of A. S. Meek). Wing, 362; tail, 218.

Range. Australian mainland.

The Red Goshawk, which seems to occur mainly in northern and eastern Australia, is undoubtedly one of the rarest and least-known hawks, and the number of specimens in museums is limited.

Hartert (1931, p. 42) has already pointed out that Mathews' names *queenslandicus* and *katherine* are synonyms of *radiatus*, and there is no reason to believe geographical variation occurs. The type and paratype of *rufotibia* Campbell have been examined; both are females which seem to fall within the variational limits of the species. Campbell's specimens, which came from northwest Australia, differ from all others contained in the H. L. White collection in being whitish on the centre of the breast and abdomen, with the undertail coverts more whitish, but with some rufous. As the name implies, the thighs are more rufous than the underparts, but this feature is matched in an adult female from Borroloola, Northern Territory, and this specimen also has a rather whitish abdomen. The rump is variable, being grey in the type of *rufotibia*, grey with some rufous in the paratype and rufous in all others seen. While the colour of the upper surface generally is rather uniform, there is much variation in the coloration of the lower surfaces. The chin and throat varies from whitish to buff, with blackish stripes, and in a male from Cairns, taken in November, 1909, the entire underparts and tibiae are deep rufous.

All but one (the type of *katherine*) of the seven specimens in the American Museum are from Queensland. Three skins in the H. L. White collection are from Borroloola, one from Cairns, and one from King River, Northern Territory. This last-named specimen, as well as another male from Borroloola have the tail incompletely barred, a sign of immaturity. In the South Australian Museum there is a male from Bathurst Island and a subadult female from Byromine, Cloncurry River, Queensland has the tail incompletely barred.

Three adults with completely barred tails and taken at Cooktown, Junction Camp, and Dawson River, Queensland, are in the Australian Museum, Sydney. Measurements:

Wing. ♂, 335, 345, 350, 352, 353 +, 355, 356, 358, 360, 362, 372.
♀, 385, 390, 395, 396, 410, 420, 420 +, 420.
Tail. ♂, 198, 200, 210, 215, 218, 220, 222, 222.
♀, 235, 235, 240, 245, 260, 265, 266, 268.

For comparison of proportions, a female *Megatriorchis doriae* measured: wing, 352, tail 330; an immature female of *Accipiter gentilis atricapillus*: wing 383, tail 305. Tail/wing ratios: *radiatus*, 1. ♀, ·64; *atricapillus*, 1, ♀, imm., ·80; *doriae*, 1, ♀, ·94.

Colours of soft parts: ♂ (? subadult); iris, pale yellowish-brown; feet, yellow; bill, blue-grey; tip black. ♂ (? juvenal); iris, yellowish-olive; feet, sulphur yellow; bill, black upper, lower bluish; cere, pale dull blue. ♀; iris, pale yellowish-brown; feet, yellow; bill, light grey, tip black.

Genus HIERAAETUS Kaup, 1844.

Type. *Falco pennata*. Ethiopian, Palaearctic, Oriental and Australian regions (5 species).

HIERAAETUS MORPHNOIDES (Gould).

Hieraaëtus morphnoides morphnoides (Gould).

Aquila morphnoides Gould, 1840 (1841), Proc. Zool. Soc. London, p. 61; Yarrundi, Upper Hunter River, New South Wales.

Aquila morphnoides coongani Mathews, 1912, Nov. Zool., 18, p. 248; Coongan River, north-west Australia. Type: AMNH No. 535063; adult male (missexed by collector as female); July 7, 1908; F.L.W. (Whitlock). Wing, 334 (worn).

Range. Australian mainland.

While the nominate race of the Little Eagle is confined to Australia; a smaller, more heavily pigmented form, *weiskei,* occurs in the mountain forests of central and eastern New Guinea. In his "Birds of Australia" Mathews pointed out the resemblances between these forms and *pennatus* of the Palaearctic region, and regarded them all as conspecific. Most authorities are now agreed that the Australian bird is distinct, and later Mathews reverted to this treatment in 1946.

We have examined 36 skins all told and can find no evidence in support of the race *coongani,* which was supposed to be a small bird. Our material is insufficient to rule out absolutely the possibility of geographical variation in colour, but since individual and age variation is great in this direction, there is no reason to suppose that such exists.

Although it is generally believed that light and dark phases occur, Fleay (1951) has drawn attention to the possibility that dark plumage may develop with increasing age. North (1898, p. 29) stated that besides being smaller, adult males are "usually darker in colour, and the abdomen, flanks, and thighs of a more uniform tint of rufous, the shaft lines always darker." An adult male from Broken Hill is actually lighter in coloration beneath than two females from the same district, and although Fleay (*loc. cit.*) has stated also that males are darker, it is felt that this distinction cannot always be relied upon. Examples of dark males have been seen from Kyabram, Victoria and Castlereagh River, New South Wales, and there is a dark female which was shot at the nest from Dawson River, Queensland.

Wing. Queensland: ♂, 343 (AMNH); ♀, 390, 393, 399 (AMNH), 370, 380, 385 (AM).
New South Wales: ♂, 334 (SAM), 345 (AMNH), 300 (juv.) (AM); ♀, 378, 380, 388 (juv.), 405 (juv.) (AM), 380, 381, 402 (SAM).
Victoria: ♀, 382 (SAM).
South and "Central" Australia: ♂, 335 (AMNH); ♀, 380 (juv.) (SAM), 374 (AMNH).
Western Australia: ♂, 334; ♀, 400 (juv.) (AM).
New Guinea (*weiskei*): ♂, 308; ♀, 327, 337, 342 (AMNH).

Young birds (juvenals) are dark—the "ginger" stage of Fleay (*loc. cit.*). They differ from dark adults in being very rufous on the head and hind-neck, darker brown on the back (although this probably fades rapidly in adults), with upper tail coverts and ventral surface a deep, dull rufous. Specimens of both sexes in this plumage have been collected in New South Wales, Victoria,

South Australia and south-west Australia, and it is possible that in life they would be mistaken for dark phase adults.

The newly hatched chick is covered in creamy-white down; iris "pale brown," cere "yellow," bill "light horn," feet "flesh colour."

The juvenal plumage is rapidly acquired, and after two months the tail is about half grown with the central rectrices dark and somewhat less strongly barred than in the adult. In the adult, colours of the soft parts are as follows: iris, "reddish brown," cere "leaden blue," bill "bluish with black tip," feet "yellowish-white."

Three birds from New Guinea (*weiskei*) in the American Museum are more heavily streaked ventrally than any from Australia. The female in this race is about the size of the male of *H. m. morphnoides*, and sexual dimorphism is equally great in both forms.

Genus AQUILA Brisson, 1760.

Type. *Falco chrysaëtos.* Synonym *Uroaëtus* Kaup. Old and New Worlds (9 species).

The single Australian member of this genus (*audax*) is often placed in *Uroaëtus* Kaup, the only character of which is that the tail is cuneate, whereas in the various species of *Aquila* it is rounded. This, in our opinion, is not of sufficient importance to warrant placing the Wedge-tailed Eagle in a monotypic genus; more particularly inasmuch as it appears to be closely related to the Golden Eagle (*A. chrysaëtos*), the type of the genus. Indeed, it is possible that *audax* is more closely related to *chrysaëtos* than is any other species of the genus.

AQUILA AUDAX (Latham).

Aquila audax audax (Latham).

Vultur audax Latham, 1801, Ind. Ornith. Suppl., p. ii; New South Wales.

Aquila audax carteri Mathews, 1912, Novitates Zool., 18, p. 247; Gracefield, Western Australia. Type: AMNH No. 535398; adult "male" (?); there is no original label on this specimen, but someone has written on the red type label of the Rothschild Museum "4-5-08 (Tunney)." Wing, 620. Coloured plate of type: Mathews, Bds. Austr. 5, plate 241, opp. p. 95.

Range. Australian mainland and southern New Guinea.

The number of skins of the Wedge-tailed Eagle preserved in Australian collections is inadequate for serious racial studies. This is partly due to the

preponderance of immature individuals and the frequency of moulting specimens, and partly because, owing to the large size of the species (which raises problems of preparation and storage), no attempts have been made by institutions to gather comprehensive series. A fully representative collection of properly-sexed individuals of all ages may reveal geographical variation on the Australian mainland, but at present we can find no evidence of this. Mayr (1937) found that a bird from Dogwa, southern New Guinea, compared "fairly well with adults from New South Wales."

Mathews described the race *carteri* in the belief that the birds of western Australia are blacker, or, at least, attain the black plumage (in which only the under tail coverts and nape remain rufous) at a younger age than do birds of eastern Australia. This would be difficult to prove except with captive birds. There is no doubt that fully adult birds are always black. H. L. White (in Mathews, 1915, p. 104) stated that a captive bird he had reared was no less than ten years old before it assumed black plumage, while Fleay (1952) has expressed the opinion that both sexes may don this plumage after six years. Old zoo birds examined by us have all been black.

There appears to be much variation in size in all parts of the range, and, as pointed out by Fleay (*loc. cit.*), unusually small individuals of either sex may be encountered. There are numerous published records of the wing span of this eagle, and some rather astonishing claims have been made by bushmen and other observers. Many records are of little value because of the neglect to distinguish age, sex, and plumage condition. Discarding a lot of reports as unreliable, Morgan (1932) found, from a series of 126 measurements of birds mainly from eastern Australia, that the average wing span was 7 feet 4 inches; there were no records less than 6 feet. The greatest wing span regarded as reliable was 10 feet, being that of a bird shot in Werribee Gorge, southern Victoria. Roche (1914) recorded 11 feet for an adult from the same locality, but this was not accepted by Morgan, who also found that the average weight of 54 birds (sexes not distinguished) was 7 pounds 15 ounces. In this case the greatest reliable record was 10½ pounds for a South Australian individual.

Considering the large proportion of young birds which fall to the gun or trap and the protracted moult of the species, the true average figures might be slightly higher than those given by Morgan, although this would be offset to some extent by the numerous reports of exceptionally large individuals, other birds being neglected by observers.

Fleay (*loc. cit.*) believes that Tasmanian birds are larger than those of the mainland, but we have found no conclusive evidence in favour of this,

neither can we refute it. He quotes one record of 9 feet 4 inches wing spread. but this has certainly been exceeded in reports from New South Wales, Victoria, and South Australia (Morgan, *loc. cit.*). Also, wing measurements of three birds in good feather from Tasmania (all females) have been found to be no greater than those of mainland birds, as shown below.

Wing. Victoria: ♂, 622; ♀, 653; 7 ♂ (imm.), 584-667 (628); 2 ♀ (imm.), 609, 667 (NMM).
South Australia: ♂, 620; ♀, 670; 3 ♂ (imm.), 590, 590, 610; ♀ (imm.), 600 (SAM).

Tail. Victoria: ♂, 444; ♀, 444; 7 ♂ (imm.), 432-457 (447); 2 ♀ (imm.), 432, 438.
South Australia: ♂, 460; ♀, 500; 2 ♂ (imm.), 420, 420; ♀ (imm.), 430.

The following description was taken from an immature male in fresh plumage collected at Peake, South Australia, in January, 1953.

Top of head, hind neck, ear coverts and back, deep buff; a very dark brown stripe along angle of jaw; rump, brown with buff edges to the feathers; tail and primaries, black; secondaries, blackish-brown; wing coverts, buffy to buffy-brown near the body; greater wing coverts, greyish-brown; chin and throat with black feathers, throat buff; foreneck, buffy-brown; breast and abdomen, dull dark brown with pale buff edges to tips of feathers. Under tail coverts, buffy-white; under wing coverts, buff; axillaries, buffy-brown. Tarsus, dull dark brown with buffy edges to feathers. Tail from below, lighter on the terminal half with dark brown bars; dark brown on basal half. Primaries 1-4 and secondaries greyish-brown with dark barrings near tip. Lores and eyelids, flesh white with black hair like feathers on lores. Iris, light hazel; bill, greenish horn with darker tips to both mandibles; feet, white; claws, black; cere, light horn; gape and inside mouth, flesh white. Wing, 590 mm.; culmen, 75 (incl. cere); wing span, 6 feet 3½ inches; weight, 7 lbs. (3175·2 grammes).

Adult male (fresh "black" plumage), Montacute, South Australia: Wing span, 6 feet; weight, 5¾ lbs. (September 28, 1947).

Adult female (fresh "black" plumage), Reedy Creek, South Australia: Iris, dark brown; feet, creamy-white; bill, horn colour with black tip; cere, gape and inside mouth, flesh-white; wing span, 7 feet 4 inches; weight, 8 lbs. 10 ozs. (May 2, 1949).

The iris has been given on various occasions also as "greyish-brown," and "yellow" for adults (? male), and "buffy-brown" in younger birds.

AQUILA AUDAX FLEAYI, subsp. nov.

Type. No. R6115, National Museum, Melbourne; adult female; Great Lakes, Tasmania; April 28, 1915; "J. E. Chubb"; wing, 653; tail, 477.

Diagnosis. Similar to birds from south-eastern mainland, but lacks the buff, golden-brown, or rufous coloration of the upper surface; the nape is buffy-white or pale buff.

Range. Tasmania.

Fleay (1952), in his excellent account of the Wedge-tailed Eagle, has drawn attention to the differences in Tasmanian birds given above. He also mentions a "slaty tinge in the wing coverts," but since only three females have been examined, we are not certain of this feature, which is entirely lacking in a large juvenal. The question of larger size in this race has already been discussed above, and while at present we feel that further evidence is required, the toes and claws in our specimens, perhaps by chance, are slightly heavier than in females from the mainland.

Wing. ♀, 667 (near adult, taken on same day as type) (NMM); 650 (juv.) (SAM).

Tail. 451 +; 490 (juv.).

Genus HALIAEETUS Savigny, 1809.

Type. *Haliæëtus nisus* = *Falco albicilla*. Synonyms, *Cuncuma* Hodgson, 1837, *Blagrus* Blyth, 1846. Old and New Worlds (8 species).

HALIAEETUS LEUCOGASTER (Gmelin).

Falco leucogaster Gmelin, 1788, Syst. Nat., 1, part 1, p. 257; New South Wales, designated by Mathews.

Haliæëtus leucogaster pallidus Mathews, 1912, Nov. Zool., 18, p. 248; Point Torment, King Sound, north-western Australia (from label; the type locality was published as "Derby"). Type: AMNH No. 535486; adult male; April 1, 1911; J. P. Rogers. Wing, 555; tail, 265.

Range. From India and Ceylon across southern Asia to the Philippines, New Guinea, Solomons, Australia and Tasmania.

Very few Australian specimens from south-eastern Australia, the type locality of the White-bellied Sea-eagle, have been examined by the writers. In the American Museum there is a skin of an immature female from New South Wales, wing 630, and another, also an immature female, from Tasmania, wing 600. In the South Australian Museum are three specimens from South Australia and one from Eitape, New Guinea. Details are: South Australia, adult male,

wing 520; immature female 620; New Guinea, adult male, wing 535. Material is lacking from India and Ceylon, so that comparisons between the extremes of the range are impossible. So far as could be determined with birds from the area reaching from Sumatra to New Guinea and Australia, there is no significant geographical variation. Australian examples may, as Hartert once suggested, be a little larger. Whistler gave the wing of an adult male from Ceylon as 544, which is about the size of the Australian birds.

The species *leucogaster* is thus to be treated as a binomial unless one wishes to consider *sanfordi* Mayr, of the Solomon Islands, a race of it. The loss of the grey and white adult plumage in *sanfordi*, as well as its apparently more predatory, upland habits, indicates that Mayr was correct in giving it specific status. The White-bellied Sea-eagle has now been recorded by Ripley (1947, p. 95) from Nissan Island, an outlier of the Solomons in the direction of the Bismarck Archipelago (where the species is common). Dr. Mayr, who spent about 10 days on Nissan while with the Whitney Expedition, tells us that this party saw no sea-eagles and could hardly have overlooked them. But the species is a great wanderer among islands, and the specimen taken by Bennett and reported by Ripley might have been a straggler, or perhaps a pair or two colonized the islands subsequent to the visit of the Whitney Expedition.

Genus CIRCUS Lacépède, 1799.

Type. *Falco aeruginosus*. Synonym *Spilocircus* Kaup, 1847. Old and New Worlds (12 species).

CIRCUS ASSIMILIS Jardine and Selby.

Circus assimilis Jardine and Selby, 1828, Ill. Ornith., 1, sig. H, plate 51 and text; Sydney, New South Wales.

Circus assimilis rogersi Mathews, 1912, Nov. Zool., 18, p. 244; "50 miles up Fitzroy River" (from label), north-western Australia. Type: AMNH No. 536039; adult male; August, 1898. The field label is unsigned but does not appear to be that of J. P. Rogers (as might be expected from the name given the bird), but rather like the labels of J. T. Tunney, who was actively collecting for the Western Australian Museum at the close of last century. According to Mathews' catalogue, he got the specimen from that museum. Wing, 397. Coloured plate of type: Mathews, 5, plate 234, opp. p. 18.

Circus approximans inexpectatus Mathews, 1912, Nov. Zool., 18, p. 245; Parry's Creek, north-western Australia. As Hartert pointed out, this specimen is *Circus assimilis* in immature plumage and not *C. approximans*. Type: AMNH No. 536283; immature male; January 22, 1909; J. P. Rogers. Wing, 387.

Circus assimilis quirundus Mathews, 1915, Bds. Austr., 5, p. 23; Celebes and the northern islands (presumably Lesser Sundas). Type not in the American Museum of Natural History.

Circus assimilis celebensis Stresemann, 1924, Ornith. Monatsber., 32, p. 48; Minahasa, Celebes.

Range. Celebes, Lesser Sundas, and Australian mainland.

In an earlier revision of the Spotted Harrier, Amadon (1941, pp. 372-375) recognized three races based on size only: *assimilis*, of southern Australia (large); *rogersi*, of northern Australia and the Lesser Sunda Islands (medium-sized); and *quirundus*, of Celebes (small). This division was not proposed with confidence, for, while specimens from Celebes are numerous, all those examined by Amadon seemed to have the wing in moult, a possible explanation of their small size. The possibility that some Celebes birds are as large as southern Australian ones was substantiated when Amadon, in the summer of 1950, measured material in the British Museum. In that collection there are two females from Celebes with wings of 443 and 451, respectively, and a female from Cape York, Australia, with wing 460. These are as large as ones from southern Australia. At the other extreme, we have examined an adult male from Victoria with wing 393, a figure matched by some Celebes males. Unless southern Australian birds migrate to Celebes and mix with a smaller local race, which we doubt, it would seem that there is too much individual size variation in *Circus assimilis* to justify the recognition of races based on size. This is not meant to deny that tropical harriers of this species average a little smaller, but even of this we are not convinced. Hartert (1931, p. 40) tentatively recognized the Celebes race, but felt "uneasy" about its validity. Rensch suggested that Lesser Sundas birds are richer coloured than Australian ones, but this impression seems based on nothing more substantial than the fact that they are less often faded than those from the drier regions of Australia.

Genus FALCO Linné, 1758.

Type. *Falco subbuteo*. Synonyms include *Tinnunculus* Vieillot 1807, *Hierofalco* Cuvier 1816, *Cerchneis* Boie 1826, *Rhynchodon* Nitzch 1829, *Ieracidea* Gould 1838, *Gennaia* Kaup 1850, *Nesierax* Oberholser 1899, *Notofalco* Mathews 1913, and *Palifalco* Mathews 1946. World-wide (about 37 species).

These names have been employed by various authors as subgenera, and in some cases genera. Friedmann (1950) lists no fewer than 54 names (subgenera and synonyms) under *Falco*.

The characters of the members of this genus are so diverse that it would

be a simple matter to derive a different subgeneric name for each Australian species, without, however, gaining a true understanding of relationships. Peters' arrangement of the group (1931) is obviously imperfect, especially with regard to the Australian forms, but without having surveyed the genus as a whole we do not venture an opinion as to whether the resemblances of some species to extralimital forms is more than parallelism. Peters associates the Grey Falcon (*F. hypoleucos*) with the hobbies ("subgenus *Falco*"). Gould, on the other hand, compared it with the Gyrfalcon (*F. rusticolus*) which Peters and Friedmann (1950) separate under subgenus "*Hierofalco.*" Gurney (1882) thought *F. hypoleucos* and *F. subniger* should be placed together with the Lanner (*F. biamarcus*), another desert form, under "*Gennaia,*" which was discarded by Peters but resurrected by Friedmann, while Mathews has proposed the names "*Palifalco*" and "*Notofalco*" for the two Australian species. The subgenus *Palifalco* was differentiated from *Falco* s.str. "in proportions as follow: The bill is larger, the wing longer, the tail shorter, and the legs notably longer, while the coloration is distinctive"; and for *Notofalco*: "differs from *Rhynchodon* Nitzsch in its much longer wings, longer tail, and weaker feet." These differences are best regarded as well-marked specific characters.

Scalation of the tarsus is extremely variable in the different species. In some cases the differences are slight, while in others they are striking. In *F. peregrinus* the tarsus is covered with rather small scales which are fairly uniform in size, while in *F. subniger* and *F. hypoleucos* they are also uniform but a little larger. In *F. longipennis* there is an inner row of enlarged scales and six or seven scutella on the lower portion of the acrotarsium, and a somewhat similar condition is found in *F. cenchroides*. The Brown Hawk (*F. berigora*), which has the tarsus unusually long and "coarse" and the tarsal scales greatly enlarged, is often placed in a separate genus (*Ieracidea*) on this account, but in every other respect it is a true falcon. In the New Zealand Bush Hawk ("*Nesierax*" *novaeseelandiae*) the tarsus is somewhat like that of *F. longipennis*, but it is relatively longer, and we are inclined to associate these two species, together with the Brown Hawk, as being closer to one another than all others in the Australian region.

Friedmann (1950, p. 575) refers to the New Zealand Bush Hawk as "*Ieracidea*" (which is not a new procedure), and suggests it is intermediate between the "true falcons" and the South American "Carrion Falcons" of the genus *Milvago*, but we cannot subscribe to this.

Mathews (1915) hinted that there were important osteological differences which would support a division of *Falco*, but none have been found apart from those of bodily proportions. There is quite a lot of variation in the amount of

emargination of the primaries in the different species, but the taxonomic value of this feature is doubtful.

The Peregrine Falcon (*F. peregrinus*) is sometimes placed in a separate genus *Rhynchodon*, and the kestrels in *Cerchneis* or *Tinnunculus*, but there are not sufficient characters to warrant generic or subgeneric division.

FALCO HYPOLEUCOS Gould.

Falco hypoleucos Gould, 1840 (1841), Proc. Zool. Soc. London, p. 162; York, Western Australia.

Falco hypoleucus ashbyi Mathews, 1913, Austr. Av. Rec., 2, p. 73; South Australia. Type: AMNH No. 537628; adult male; 1902; "North." Wing, 298; tail, 146? The type is a very poor specimen with most of the feathers missing from the head.

Falco hypoleucus ashleyi Mathews, 1916, Bds. Austr., 5, p. 234 (*Lapsus* for "*ashbyi*").

Range. Interior of Australia.

The Grey Falcon is one of the least known of Australian Accipitres. It clings to semi-arid districts, and avoids the forested areas of coastal regions. Owing to limited amount of material at our disposal there is little opportunity to make geographical comparisons, but variation is scarcely to be expected in this wide-ranging species of the interior of the continent. Specimens have been examined from Parry's Creek, north-western Australia; Borroloola, Northern Territory; north Queensland; Barcoo (Victoria) River, south-western Queensland; Garah, Mungindi (both near Moree), Broken Hill, Nevertire, Wagga, Temora, Cobborah, Byrock, near Moulamein, New South Wales; and from Callabonna Creek, Laura, Yunta, and Fulham (near Adelaide—S. A. White Collection), South Australia. No important differences were detected. Wear and dirt transforms the beautiful blue-grey coloration of the fresh plumage to a dull grey.

Wing. ♂ (adult), 287, 288?, 298 (AMNH), 290, 290, 302 (AM), 268, 275, 285, 295 (HLW), 280 (SAM); (immature) 281, 286, 294 (AMNH), 265 (AM), 294 (HLW).

♀ (adult), 335 (AMNH), 325, 330, 338 (AM), 315, 320 (SAM); (immature) 297, 315 (AM), 320 (NMM).

Tail. ♂ (adult), 146? (AMNH), 155, 177, 170 (AM), 138 +, 150, 147 +, 163 (HLW), 150 (SAM); (immature) 143 (AM), 144 (HLW).

♀ (adult), 170? (AMNH), 156, 170, 174 (AM), 185, 175 (SAM); (immature) 163, 175 (AM), 180 (NMM).

In juvenals the whitish breast, foreneck and abdomen is heavily streaked and blotched with brown or blackish brown, and the back, scapulars and rump are greyish brown with pale buff edges to the feathers. The primaries are very dark grey or blackish, strongly barred with pale buffy-white, while the rectrices are grey and feebly barred dark grey, the subterminal portion being blackish, with a white tip. In adults the tail is strongly barred while the entire upper surface is blue-grey with darker shafts, and below, pale grey with dark shafts.

A female, collected at Orroroo, South Australia, in October, 1933, had iris "dark brown," feet "yellow," pharynx "grey." Wing span was 98 cm. Stomach contents: "Flesh and hair of a mouse-like creature—no bones present and flesh almost digested" (J. T. Gray).

FALCO SUBNIGER Gray.

Falco subniger Gray, 1843, Ann. Mag. Nat. Hist., 11, p. 371; Australia (Victoria fixed by Mathews).

Notofalco subniger minnie Mathews, 1915, Austr. Av. Rec., 2, p. 127; Minnie Downs, Queensland. Type: AMNH No. 537096 (adult male); January 6, 1882. According to Mathews' manuscript catalogue this was one of the specimens he acquired from the Norwegian naturalist, Robert Collett. Some or perhaps all of Collett's material from northern Australia, including, perhaps, the present type, was collected by Knut Dahl. Wing, 374; tail, 22. Coloured plate of type; Mathews Bds. Austr., 5, plate 255, opp. p. 253.

Range. Interior of Australia.

The Black Falcon, endemic to the more open country of the mainland, is a rather elusive species which occasionally visits coastal districts. Individual variation is great, but there is no geographical variation.

Mathews merely fixed the type locality in the southern part of the species' range and named a race from the northern part to have one of his names available if needed. The Mathews collection contained only four specimens of *subniger*, three from Queensland and one from Horsham, Victoria. Three carefully labelled specimens were secured in Queensland in 1940 by Messrs. L. Macmillan and J. R. Henry for the American Museum.

About thirty skins have been examined from the interior of eastern Australia, and it is thought that immatures have more white about the head than adults. A breeding (? adult) female from the Diamantina River, south-western Queensland, which was collected in July, 1918, has a very white throat, and there are some white spots on the breast, and the under tail coverts are

prominently barred with white. Most individuals have some white at the chin, although in at least two males and one female this feature is entirely absent.

The Black Falcon is at once distinguished from the extreme dark phase of *Falco berigora* by its much shorter and more powerful tarsi; the light markings on wing and tail are more sparing or absent on the tail and are whitish, not rufous.

Wing. Queensland, ♂ (ad.), 371, 371, 374; (imm.) 366 (AMNH); ♀ (ad.), 391, 392 (AMNH); 403 (British Museum).
Victoria, ♂ (imm.), 368 (AMNH).
Loc.? ♀, 405 (British Museum).
South Australia, ♂, 363, 363, 366 (SAM); ♀, 405, 405, 415 (SAM).
New South Wales, ♀, 393 (SAM).
South-western Queensland, ♀, 405 (SAM).

Tail. Queensland, ♂ (ad.), 219, 221, 222; (imm.) 215; ♀ (ad.), 223, 226 (AMNH).
Victoria, ♂ (imm.), 206 (AMNH).
South Australia, ♂, 219, 220, 220; ♀, 247, 235, 235.
South-western Queensland, ♀, 240 (SAM).

Weight. Queensland, ♂ (full breeding condition), 597; (imm.), 607; ♀ (full breeding condition), 670 grammes.

Soft part colours of a pair of breeding adults (June 14): "Iris brown, bill bluish-horn with black tip, cere bluish, legs and feet livid pale blue flesh." The skin around the eye has sometimes been recorded as "whitish" or "bluish-grey."

A chick taken from the nest towards the end of July was covered in white down with the primaries (brown) just showing. The irides were "dark brown," bill "pale bluish-horn," cere "pale bluish-horn," feet "pale bluish."

In the juvenal the cheeks are often buffy-white, the throat is whitish with dark brown streaks, and a moustachial stripe is visible. In some juvenals also the rectrices and primaries are indistinctly barred with pale buff, but we have been unable to trace the sequence of plumage changes to the adult condition from the limited material at our disposal.

FALCO PEREGRINUS Tunstall.

Falco peregrinus macropus Swainson.

Falco macropus Swainson, 1837, Anim. in Menag., p. 341; Tasmania.

Range. Australia (except south-western Australia), Tasmania.

The Peregrine Falcon, of which about 18 races may be listed from most

parts of the world, is widespread but not very plentiful in Australia. Altogether we have examined 58 skins of juvenals and adults in the museums in Adelaide, Melbourne and Sydney, and there are eight specimens in the Mathews collection in New York.

Available material is rather disappointing as it is largely composed of immature individuals. The head, cheeks and malar region are dull black in adults and brownish or brownish-black in juvenals, and while individual variation is prevalent, females are distinguished by a stronger buffy wash on the ventral surfaces, but this colour may also be an indication of age and geographic variation. From Tasmania, the type locality of *macropus*, we have two adult birds, unsexed but obvious males, in which the characteristic ventral buffy wash is almost lacking and replaced by grey on the abdomen, flanks and thighs. Further material may show that the island birds are a distinct population, but this is doubtful.

From the drier areas of the mainland, specimens are somewhat paler than those from eastern Australia, and there is often a reduction of the ventral barring, characters which in part may be due to fading and abrasion, especially as the moult is irregular and prolonged.

No geographic variation in size has been detected in Australian birds, which have average dimensions only slightly below those of the American and British races.

Wing. Tasmania, ♂ (ad), 280, 290 (SAM).
Victoria, ♂ (ad.), 280; ♂ (juv.), 280, 285, 290; ♀ (juv.), 332-344 (338·5) (NMM), 337 (HLW).
New South Wales, ♂ (ad.), 285-300 (293) (AM), 290 (HLW); ♂ (juv.), 289-300 (294); ♀ (ad.), 305-340 (327) (AM), 325 (SAM); ♀ (juv.), 320-348 (330·7) (AM), 320-330 (332·3) (HLW), 330 (SAM).
South Australia, ♂ (ad.), 270, 282, 295; ♀ (ad.), 325, 325, 328; ♀ (juv.), 325, 335 (SAM), 328 (HLW).

Tail. Tasmania, ♂, 144, 164.
Victoria, ♂ (ad.), 163; ♂ (juv.), 155, 162, 165; ♀ (juv.), 174-185 (179·7), 175.
New South Wales, ♂ (ad.), 140-145 (142), 160; ♂ (juv.), 148-155 (150·7); ♀ (ad.), 170-185 (175), 170; ♀ (juv.), 173-195 (182); (182); 170.
South Australia, ♂ (ad.), 135, 144, 158; ♀ (ad.), 170, 170, 170; ♀ (juv.), 162, 172, 174.

In fresh juvenal plumage the feathers of the crown are tipped with cinnamon buff and the nape region may be of the same colour; there is often a pale rufous auricular patch, but the cheeks and malar region are dull black. The upper surfaces are dark brown with cinnamon buff or pale buff tips to most of the feathers, and the tail coverts are barred with the same colour as also are the rectrices (incompletely). Ventrally the ground colour is a buffy-white, becoming deeper on the abdomen, and the breast and abdomen have well-defined brownish stripes which become sagittate on the flanks and thighs. The duration of the juvenal plumage is unknown, but fading is common and wear (or partial moult?) may cause a reduction in the intensity of the ventral stripes. It is possible that this plumage is retained for more than one year.

A juvenal breeding female in wore plumage has some new grey (barred) feathers on the lower scapular region, and the upper tail coverts are completely replaced with grey feathers with darker barrings, as in the adult condition. This bird was shot at the nest in October near Burra, South Australia. A male taken on the Upper Murray River, in May, has acquired full adult plumage, including the strongly barred grey tail, but the head is like the juvenal, and there is a trace of rufous at the nape.

Signs of moulting have been observed in skins taken at all seasons of the year, but this process probably begins in spring and is completed by the following winter.

A juvenal female collected at Two Wells, South Australia, in February, 1933, weighed 2 lb. 2 oz.

Falco peregrinus submelanogenys Mathews.

Falco peregrinus submelanogenys Mathews, 1912, Austral Av. Rec., 1, p. 33; "Bokerup, Plantagenet Arch," south-western Australia. Type: AMNH No. 537365 (?) near adult female; April 14, 1900; J.T.T. (Tunney), Wing, 320; tail, 175. Figured, Mathews, Bds. Austr., 5, plate 254, opp. p. 241.

Range: South-western Australia.

Diagnosis. About the size of *F. p. macropus,* from which it differs in being pale rufous on the foreneck and upper breast, and deep rufous on the lower breast and abdomen, with blackish shaft lines and regular cross barrings.

It would appear that this race is confined to South-west Australia. A single adult female in the American Museum from north-western Australia is much paler above and below than Mathews' type (cf. Mayr, 1941, p. 1), and South Australian birds are also rather light-coloured.

Certain features of the type of *submelanogenys,* such as buff tips to the feathers of the dorsal surface, suggest that it may not be quite adult. The

only other specimen we have examined from south-western Australia is contained in the H. L. White collection. It is a juvenal male with a few adult feathers on the back and scapulars (from Pallinup River), and is much darker below than eastern birds in similar plumage. The breast and abdomen are a deep, dirty buff with heavy blackish markings, and the foreneck is buffy-white, with some grey adult feathers appearing on the back and rump. Wing, 290; tail, 153.

Reference to "The Birds of Western Australia," by Serventy and Whittell (1951, p. 210), reveals that these authors regard the normal coloration of the breast of the adult as "chestnut-brown," with the abdomen, flanks, thighs and under wing coverts "chestnut" with blackish spots and barrings, but we have seen nothing from *eastern* Australia which will answer to this description.

It is true that the amount of buff colouring on the ventral surface is subject to individual variation, as mentioned by several authors, including Mayr (1941), and we have before us an adult male from Cobborah, New South Wales (February taken), which is quite dark below, as well as four juvenal females from the same area. Nevertheless, we anticipate that further material will confirm beyond all doubt that south-western birds are distinct.

Mathews claimed in his original diagnosis that *submelanogenys* was large, but later, in his "Birds of Australia," stated that eastern Australian individuals were larger than those from the west. Actually there are no appreciable differences.

FALCO LONGIPENNIS (Swainson).

The Little Falcon occurs in all parts of Australia and Tasmania, and in winter it is believed that some birds visit southern New Guinea and other islands to the north of the continent. A well-marked race, *hanieli* is resident on the Lesser Sunda Islands; it is small, and pale ventrally. In Australia, two geographical races are recognizable, a southern *longipennis* and an interior and northern *murchisonianus*. Altogether, we have examined 90 specimens in the museums of Adelaide, Melbourne and Sydney, and there are 67 skins from Australia in the American Museum.

Adequate material for comparison from Western Australia is lacking, but the few skins we have examined from that area have raised certain problems concerning plumage coloration, which will be discussed below.

Falco longipennis longipennis Swainson.

Falco longipennis Swainson, 1837, Anim. in Menag., p. 341; Tasmania.

Falco melanotus White and Mellor, 1913, Emu, 12, p. 164; Flinders Island, Bass Strait. Not Shaw, 1809, Gen. Zool., 7, i., p. 86.

Falco longipennis samueli Mathews, 1916, Bds. Austr., 5, p. 232; new name for *melanotus* White and Mellor.

Range. Tasmania, islands of Bass Strait, and the more humid areas of southern, eastern and south-western Australia; (?) mid- and north-western Australia.

Diagnosis. Head, hind neck, cheeks, auriculars and malar region sooty black; upper surfaces very dark grey; upper breast deep buff with heavy blackish streaks, becoming rufous brown on the lower breast and abdomen, with heavy blotches and barrings of blackish coloration, these markings extending to and becoming darker on the sides and flanks, with some scattered pale buff blotches.

Individuals of the nominate race are at once recognized by the black head and extensive blackish markings on the under surfaces. In eastern Australia this race occurs in the humid coastal regions bounded approximately by the Dividing Range from southern Victoria to southern Queensland. The occurrence of similar dark birds in South-west Australia and other localities in that State might suggest that dark birds are merely a colour phase, but we have seen no dark birds from the interior, and no light specimens have been collected in Tasmania nor the coastal regions of the south-east. In the American Museum there is a very dark adult female from Parry's Creek, north-west Australia (February taken), as well as two dark immature females from mid-west Australia (De Grey River, June 28, and Pt. Cloates, March 14). Possibly these birds were migrants or wanderers from further south, where dark individuals very similar to those found in south-eastern Australia occur. The southern form of the Collared Sparrowhawk has also been taken at De Grey River. The affinities of South-west Australian birds with those of south-eastern Australia is well known in many groups, and at present it is preferable to unite the two populations under *longipennis,* although a specimen of an adult female from King George's Sound, taken in February and now housed in the Australian Museum (No. 023881), has prominent blackish streaks on the breast *only* and is more rusty rufous below than most others. Dark individuals from South-west Australia have been examined from the following localities—Armadale, Gordon River, King George's Sound, Lake Muir and Wilson's Inlet. As expected, a skin from Zanthus belongs to *murchisonianus.*

Females in both races appear to be slightly more heavily pigmented than males, but the present form is a striking one and readily separable, even though intergradation occurs with *murchisonianus* in certain areas. Characters are variable in birds from north of the main Divide in Victoria, south-eastern South Australia, and in the vicinity of Wagga, Parramatta, Lithgow, and Yandembah,

New South Wales, and Queensland coastal regions north to Cairns. In these areas some birds are dark above and light below, while others show the reverse condition, and usually the head is not so intensely black; perhaps they are better classed under *murchisonianus*.

Wing. Tasmania, ♂ (ad.), 230 + (worn) (RAOU collection).
Victoria. ♀ (ad.), 264 (SAM).
New South Wales, ♂ (imm.), 242; ♀ (imm.), 265, 272 (AM).
Queensland, ♂ (ad.), 245 (AM).
South-west Australia, ♂ (ad.), 245 (NMM); ♂ (juv.), 238 (HLW); ♀ (juv.), 242, 245 (AM).

Juvenals are generally darker than those of the pale form. The head is brownish black with a rufous tinge, the upper surfaces dark brown with dull rufous edges to the feathers, while ventrally the throat is pale buff, breast and abdomen rufous brown with brownish black stripes and markings; thighs and centre of abdomen and under tail coverts deep buff.

Falco longipennis murchisonianus Mathews.

Falco lunulatus murchisonianus Mathews 1912, Nov. Zool., 18, p. 252 (January 31); East Murchison, Western Australia. Type: AMNH No. 537513; adult male; September 22, 1909. "F.L.W." (Whitlock). Wing, 247.

Falco lunulatus apsleyi Mathews, 1912, Austral. Av. Rec., 1, p. 33 (April 2); Melville Island, Northern Territory. Type: AMNH No. 537523; immature female, moulting into adult plumage; October 22, 1911; J. P. Rogers. Wing, 262 (imm. primaries).

Range. The drier parts of Australia, extending to the Kimberleys, Western Australia, and coastal Northern Territory.

Diagnosis. Differs from the other Autsralian race in its much paler coloration above and below. The head is brownish black with a rufous wash; cheeks and malar region brownish black; upper surfaces pale grey with black shaft lines; primaries greyish brown instead of brownish black. Ventral surface pale rufous brown, with the heavy blackish markings of the nominate race reduced to narrow brownish stripes on the upper breast and indistinct greyish barrings on the sides and flanks.

Examples of this race have been collected from such widely separated localities as Derby and Zanthus, Western Australia, the Gulf of Carpentaria, Queensland, and Cootamundra, New South Wales. Of "*apsleyi*," Mathews stated that it was similar in colour to *murchisonianus* but larger; judging from

the few northern skins at our disposal, this seems unlikely. There is a perfect gradation between *F. l. longipennis* and *l. murchisonianus*, but the differences between typical examples of each form are marked and it is surprising that this fact has not been emphasized previously.

Measurements, except where otherwise indicated, are from skins in the South Australian Museum.

Wing. North-west Australia, ♂ (imm.), 245 (AM); ♀ (imm.), 265, 273.
Northern Territory, ♂ (ad.), 244; 248 (AM); ♀ (ad.), 267, 276, 278.
Queensland, ♂ (ad.), 248; ♂ (imm.), 237; 240 (NMM); ♀ (ad.), 268; 270 (NMM); ♀ (imm.), 267.
South Australia, ♂ (ad.), 242, 243, 240, 240 +; ♂ (imm.), 238; ♀ (ad.), 245 +, 250, 255 +, 255, 271, 272; ♀ (imm.), 267, 272.
New South Wales and Victoria, ♂ (ad.), 235 +, 237, 244 (SAM), 242 (NMM); ♂ (imm.), 235 (NMM); ♀ (ad.), 266; ♀ (imm.), 267, 275 (SAM), 265 (AM).
South-western Australia, ♀ (ad.), 268 (NMM).

Juvenals are markedly different in coloration from adults. The top of the head is bright rufous with very narrow blackish shaft lines, the upper surfaces are dull brown with rufous edges to the feathers, and the two central rectrices are similarly coloured with incomplete rufous barrings and a broad rufous tip. Cheeks and malar region are brownish black, throat and upper breast pale buff becoming a bright rufous brown on the breast and abdomen and darker rufous on the sides. Dark markings are limited to the upper breast and thighs and are brown and very little wider than the central dark shafts.

Moult commences on the head and scapular region, the rectrices being replaced last. From numerous juvenal specimens it would seem that the juvenal plumage is retained for less than one year when the assumption of adult plumage is commenced in spring, the whole process taking at least six months. A few examples have indicated that moulting may also commence at the end of autumn, but these may be individuals which were hatched early in the previous season. The normal breeding period for this race is between August and January.

Sodrrberg (1919, plate 1) shows, in natural colours, a juvenal in fresh plumage (fig. 3) and what he believes to be an adult with bleached plumage (August-taken) in fig. 2. Actually this last-named illustration is of a juvenal in worn and faded plumage, which is frequently met with just prior to the commencement of the moult.

Colours of soft parts. Adult (sexes similar): iris, dark brown or (?) reddish (one record); bare space around eye bluish white, pale blue or bluish grey; cere, greenish yellow; bill, bluish horn with dark tip to upper mandible and darker mottlings on the lower; legs and feet, yellow; claws, black. The iris may be paler in juvenals.

Weight of four adult females, collected between June and August: 247, 248, 325, 420 grammes. Wing span of two adult females, 30¾ inches, 33 inches.

FALCO CENCHROIDES Vigors and Horsfield.

Falco cenchroides cenchroides Vigors and Horsfield.

Falco cenchroides Vigors and Horsfield, 1827, Trans. Linn. Soc., London, 15, p. 183; New South Wales.

Cerchneis unicolor Milligan, 1904, Emu, 6, p. 2; Yalgoo, Western Australia. Type said to be in Western Australian Museum, Perth.

Cerchneis cenchroides milligani Mathews, 1912, Nov. Zool., 18, p. 253; the type locality was published as Parry's Creek, north-western Australia, but the field label says "Point Torment, King Sound." Since there is a specimen taken by the same collector at Parry's Creek, it is possible that the type label was tied on the wrong specimen, but this cannot be proved. Type: AMNH No. 538594; adult male; January 7, 1911; J. P. Rogers. Wing, 232 (?) (worn); tail, 149 (?) (worn).

Range. Australia and Tasmania, straggling to Aru, Ceram, the Moluccas, and Babber, South-west Islands. A number of stragglers have been recorded from widely separated localities in the north and south islands of New Zealand.

The Nankeen Kestrel is very plentiful in southern Australia and probably a permanent resident in many districts. However, it is possible that seasonal or other movements may occur, because four specimens which were taken in Ceram, Moluccas (April 29) and Babber, South-west Islands (August 24, 29, September 1) are inseparable from Australian birds and presumably migratory stragglers.

Careful comparison of material from all parts of Australia reveals no geographical variation, although a larger series might show interior birds to be a little smaller. We have seen no specimens from Tasmania. Mathews, at least at one time, believed there were no subspecies in Australia, and Hartert (1931, p. 46) was of the same opinion.

The plumages of the Nankeen Kestrel present some problems which, perhaps, can only be answered by study of birds of known age, i.e., ones kept in captivity for a period of several years. Individuals with heavy black barrings and

hastate markings on the back and wings and prominent stripes on the head are rare in collections but appear to be first year birds. Ventrally, the breast is deep rufous with dark brown streaks, and females are much darker generally in this plumage than males. Study of skins has established that in males first the rump, then the tail, and finally the head becomes grey, and this involves several months. A few specimens with rufous rectrices were found to be males although labelled as females, and this was confirmed by the presence of a grey rump, which never seems to be present in the last-named, even in old birds with greyish tails. The rufous immature rectrices are barred with black in both sexes, but more strongly in females. In the adult the central pair is usually almost immaculate (except for the subterminal black band), and the barring is much reduced on the others. From one or two males with the tail in moult it is evident that, even in the adult, the new rectrices are quite rufous at one stage; the whitish or even grey colour is in part acquired later as a result of fading; but the feathers do have a glaucous sheen. In most adult males with grey tails the edges of the rectrices are rufous in fresh plumage. The grey of the head in the male seems to be partly a matter of wear as well as age; in females the head is rufous with dark shaft lines, never grey.

In the tail of the adult female the barring often becomes reduced throughout with maturity and is absent in the central pair of rectrices. The tail is usually rufous in females at all ages, but in one specimen it is quite greyish, but the rump is rufous.

Fading of the plumage appears to be rapid and prevalent in birds even in southern districts. A female, taken in South Australia in December, shows the new rectrices (nearly half-grown) of a much deeper shade than the remainder of the rufous feathers of the dorsal surface. Juvenals in fresh plumage have a decided rufous or buffy wash ventrally, especially on the upper breast, and the dark shaft lines, which extend from this area to the sides of the body, are wider and heavier than in adults. Males are paler rufous below and with less dark striping than members of the opposite sex.

In the adult, the dark markings of the dorsal surface are much reduced and confined to the head, scapulars and secondaries, and in some old males are almost absent.

Sexual dimorphism in this species, as in kestrels in general, is much less than in some members of the genus *Falco*. Nevertheless, unusually small individuals are fairly common, especially amongst males.

Adult males of *cenchroides* in good feather seldom have a wing length as great as 255 mm., while in females the wing is almost always more than 255, generally 260 or more and reaching 275.

Colours of the soft parts (sexes alike): iris dark brown; bill dark blue at tip, lighter at base; cere, legs and feet yellow; eyelids yellow with a greenish tinge. Weight (female, juvenal, March), 128 grammes; female adult (December), 272·2 grammes. Span of wings: Female juv., 29¼ inches; female adult, 30½ inches.

Falco cenchroides baru Rand.

Falco cenchroides baru Rand, 1940, Amer. Mus. Novit., 1072, p. 1; 11 km. N.E. of Mt. Wilhelmina.

Range. Oranje Range, New Guinea.

Examination of our specimens of this well-marked race (and other species of kestrels) suggests that the Australian form of *cenchroides* is in a somewhat transitional stage as regards sexual and age colour dimorphism. In adult males of *baru* the grey of the head is much deeper than ever it is in the nominate race, and it extends around to the sides of the throat; the tail is also greyer with further suppression of the black barring (except the subterminal band). This increase of the grey elements in the plumage is reflected in the immature stages, at least as regards the tail, for a two-thirds grown nestling has the tail feathers grey except for rufous tips. These feathers have more black bars than those of the adult, although much fewer than are found in immatures of *cenchroides*. The crown of this nestling of *baru* is rufous. In the adult female the head and tail are grey, though the former is not such a clear grey as in the male.

When describing *baru*, Rand hinted that *cenchroides* and *tinnunculus* might be regarded as conspecific by some workers, but the occurrence of two sympatric species, *tinnunculus* and *naumanni*, in southern Europe argues against too much species lumping in the group.

On Ceram, at least, there is resident *Falco moluccensis* which might be regarded as a geographical representative of *cenchroides*. This form, perhaps because of its tropical habitat, has less sexual dimorphism than *cenchroides* or *tinnunculus*, and most workers regard it as a distinct species.

NEW FORMS DESCRIBED.

Aviceda subcristata njikena (Fitzroy River, Western Australia).
Haliastur indus flavirostris (Bougainville Is., Solomons).
Aquila audax fleayi (Great Lakes, Tasmania).

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